THE

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WATER SUPPLY, & SANITARY IMPROVEMENT.

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GAS PURIFICATION
BY
OXIDE OF IRON.

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CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
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THE
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See Advertisement in last week's JOURNAL, page 82.

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THE
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ESTABLISHED 1840.

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GEORGE GLOVER AND CO.,
DRY GAS-METER MANUFACTURERS,
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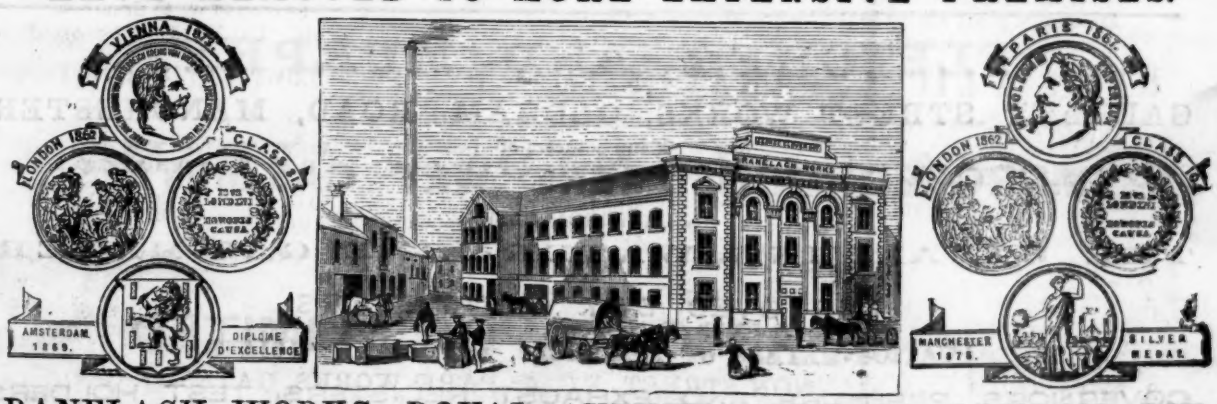

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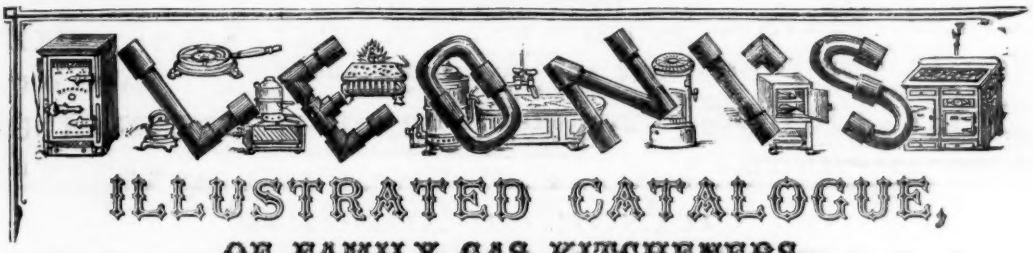
Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.



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COOKERS, HOT-PLATES, STOVES, BATH-BOILERS, &C; SENT FREE.

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IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

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IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS.

And all kinds of Experimental Gas Apparatus.

HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

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ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

IMPROVED HYDRAULIC CRANES,

Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at Beckton, Hull, and other Gas-Works.

HYDRAULIC APPARATUS for Lifting and Lowering Purifier-Covers.

Sixteen recently erected at Beckton, applied to Covers 30 feet square.

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IN SUCCESSFUL OPERATION AT THE NEW WORKS OF THE NEWCASTLE AND GATESHEAD GAS COMPANY, AND IN COURSE OF ERECTION AT THE CARLISLE CORPORATION GAS-WORKS.

Special "REGULUS COCKS" manufactured to stand Acid.

FOR PARTICULARS, APPLY TO

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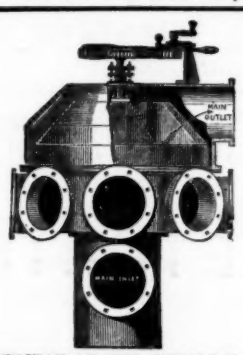
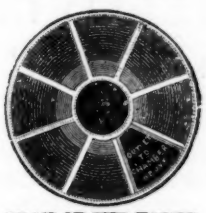
2, SUFFOLK LANE, CANNON STREET, E.C., or PARK WORKS, GATESHEAD-ON-TYNE.

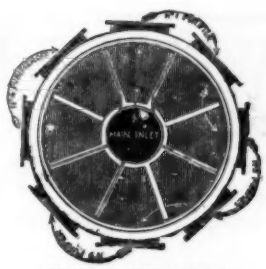
C. & W. WALKERS'
PATENT CENTRE-VALVES.



ELEVATION OF THE CENTRE-VALVE.



PLAN OF THE VALVE.



PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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GAS ENGINEERS,

WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

EVERY DESCRIPTION OF GAS APPARATUS.

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NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

GASHOLDERS AND TANKS.

RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

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GAS PURIFICATION & CHEMICAL Co., LIMITED,

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MANUFACTURERS OF

IMPROVED CENTRE-VALVES,

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

WEST'S GAS IMPROVEMENT COMPANY.

LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,

And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

EDWARD COCKEY & SONS,

GAS ENGINEERS, FROME SELWOOD,

MANUFACTURERS OF ALL DESCRIPTIONS OF

APPARATUS CONNECTED WITH GAS-WORKS.

THE ORIGINAL PATENTEES AND MANUFACTURERS OF THE

DRY-FACED VALVES

FOR PURIFIERS, GASHOLDERS, BYE-PASS, AND OTHER ARRANGEMENTS REQUIRING VALVES IN GAS-WORKS.

The Faced Valves, as made by the Patentees, continue to give great satisfaction, and they are being used extensively by many of the best gas engineers of the day.

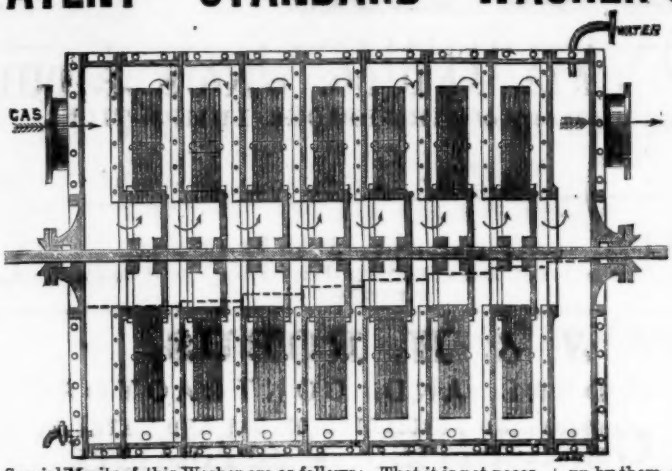
They are more easily repaired than any other kind of Valve in use, and can be re-ground in a few hours without removal, and made perfectly gas-tight.

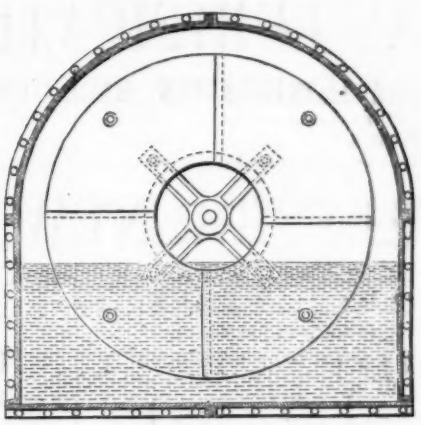
References can be given to many Engineers of high standing, who will testify as to the favour in which they are held.

MANUFACTURERS ALSO OF SUPERIOR WOOD GRIDS FOR PURIFIERS, SCRUBBERS, &c.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER COMPANY.





The Special Merits of this Washer are as follows:—That it is not necessary to reduce the temperature of the gas to 60°, or thereabouts, to make it effective; and that as no tar is retained in it, the illuminating power is not reduced as in Tower Scrubbers. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas as it ascends. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine, as well as a very large quantity of carbonic acid and sulphuretted hydrogen. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

MESSRS. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan.* 14, 1879.

Gentlemen,—In reply to your inquiry, I am pleased to say the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, it takes out every particle of Ammonia, while purifying more Gas than it was intended to do. I enclose particulars of a week's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c., (Signed) JOHN CLARK, Engineer.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 7	11	9	7	5½	3¾	3	1⅜	1¼	¼	0	10 Gallons.	59,000	Nil.	74°	66°	31°	25	23¼	5
,, 8	9½	7½	6	4½	3	2	1	¾	¼	0	10 ,,	78,000	Nil.	73°	61°	31°	28	26¼	4¼
,, 9	11	9	7	5	3¾	2½	1¼	1	¼	0	10 ,,	82,000	Nil.	74°	67°	33°	27½	25½	5
,, 10	10¾	8½	6¾	5	3½	2¼	1½	1	¼	0	10 ,,	66,000	Nil.	76°	64°	28°	28¼	27	5
,, 11	12½	10	7¾	5¾	4¼	3¼	1¾	1¼	¼	0	10 ,,	61,000	Nil.	73°	64°	27°	26½	25¼	5
,, 12	11	8¾	6¾	—	—	—	1¼	¾	¼	0	10 ,,	39,000	Nil.	74°	64°	27°	25¼	23½	5
,, 13	13	10¾	8¼	6	4¾	3½	2	1¼	¼	0	10 ,,	78,000	Nil.	73°	65°	42°	28	26	5

MESSRS. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May* 23, 1879.

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March* 6, 1879.

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				10	9	8	7	6	5	4	3	2	1	
64,000	Inlet	2·00	2·00	158·8	72	57	21	4½	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	63
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces.	11·0	8·4	6·3	4·5	2·7	1·7	1·8	0·7	0·3	—	

MESSRS. KIRKHAM and HERSEY. *The Leeds Corporation Gas-Works, Meadow Lane, Aug.* 14, 1879.

Gentlemen,—In reply to your inquiry of yesterday's date, I have pleasure in stating that the item appearing as income derivable from Ammonia in my estimate of revenue for current year is not an exaggeration. Our average income from Ammonia is 2s. 8d. per ton of coals carbonized, but at the works where your invention is in use we derive not less than 3s. per ton. Since the introduction of efficient Scrubbers at our works the greater yield of this product (now twice as valuable as coke to us) is such that the cost of Apparatus for its extraction can be wholly paid for out of from nine to twelve months gains.

I am, Gentlemen, yours faithfully, (Signed) H. WOODALL, Engineer.

MESSRS. KIRKHAM, HULETT, and CHANDLER. *Woolwich Equitable Gas Company, Engineers Office, Nov.* 1, 1879.

Gentlemen,—In answer to your inquiry respecting Washer erected here in September last, and which has been working here constantly since Oct. 1, I beg to say that it is working very satisfactorily. We sell over 24 gallons of 10 oz. liquor per ton of coal carbonized, and depend upon your Washer to extract all Ammonia, which it does satisfactorily, not leaving a trace of free Ammonia at the outlet. It takes little power to drive it, and the difference of pressure between inlet and outlet is scarcely noticeable, being less than half an inch. I consider it a very valuable machine, and have little doubt that it will pay for the outlay in a very short time. I shall be pleased to show it to any one that may be in want of such a machine, when they can see its capabilities themselves.—I am, Gentlemen, yours faithfully, (Signed) W. WHITE, Engineer.

MESSRS. KIRKHAM and HERSEY. *Heywood Local Board Gas-Works, Hooley Bridge, Heywood, Dec.* 1, 1879.

Gentlemen,—In reply to your favour of the 28th ult., I beg to state that the Scrubber is at work, and doing well. I shall be glad to show it to any inquirers.—Yours truly, (Signed) EDWIN BUCKLEY, Engineer.

MESSRS. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Dec.* 19, 1879.

Gentlemen,—In accordance with my promise that I would inform you as to the working of the "Standard" Washer erected by you here in June last, I now write to say that we are passing through it 100,000 cubic feet per hour (the quantity for which it is made) direct from the Condensers, "bye-passing" the whole of our Scrubbers, which, not being needed, have been standing still since the "Standard" Washer was put in use. It seems as though the Washer more effectually removed the Ammonia when taking the full quantity of gas than less; as, at the present time, at the sixth chamber (there being eleven in all) not a trace can be discovered either by turmeric or acid litmus paper. The difference in pressure between inlet and outlet is only ten-tenths of an inch. I need scarcely say, after the above, how perfectly satisfied I am. (Signed) P. J. WATES, Engineer.

For further particulars and testimonials, address Messrs.

KIRKHAM, HULETT, & CHANDLER, LIMITED, 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ESTABLISHED IN 1860.
BENJAMIN CARPENTER,
THE ORIGINAL MANUFACTURER OF THE IMPROVED
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.

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The Dunston Engine Works Co.,
GATESHEAD-UPON-TYNE.
Are the Sole Manufacturers of
Archer's Patent Hoists,
ALSO OF
Archer's Patent Stone Breaker,
AND OF
Archer's Patent Ore Crusher & Pulveriser,
The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

Less Heat, No Smoke.

White Light, & Economy

SPECKSTEIN & LAVA
Gas-Burner Fabricants
On the most approved French and German principles.
These Burners can be made to consume from 1¼ feet to 20 feet of gas per hour, and to give a light from 4 to 150 candle power.
Terms and Discount on application.
Catalogue, 6d. Sample Burner, 1s.
AUGUSTUS WESTWOOD & Co.,
COMMERCIAL CHAMBERS,
WEST BROMWICH.

"TANNIC GELATINE,"
FOR
REMOVING AND PREVENTING INCRUSTATION OF EVERY DESCRIPTION OF STEAM BOILERS; ALSO CORROSION.

Manufactured only by
WILLIAM RICHARDSON,
GAS ENGINEER,
94, CHARLES HENRY STREET, BIRMINGHAM.

Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON AND SONS,
SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS, RATCHET BRACES, LIFTING-JACKS, ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.
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EDWARD BROOKE AND SONS,
FIELDHOUSE FIRE-CLAY WORKS, HUDDERSFIELD,
MANUFACTURERS OF
GAS-RETORTS, FIRE-BRICKS, &c.,
Which have been extensively used for 30 years in the construction of Glass Furnaces, where the heat is five times greater than in Gas Ovens; superior to any Retorts or Fire-bricks in the market for standing intense heats, and not contracting.

JOHN HALL AND CO., STOURBRIDGE,
Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

J. & H. ROBUS,
BUILDERS AND CONTRACTORS
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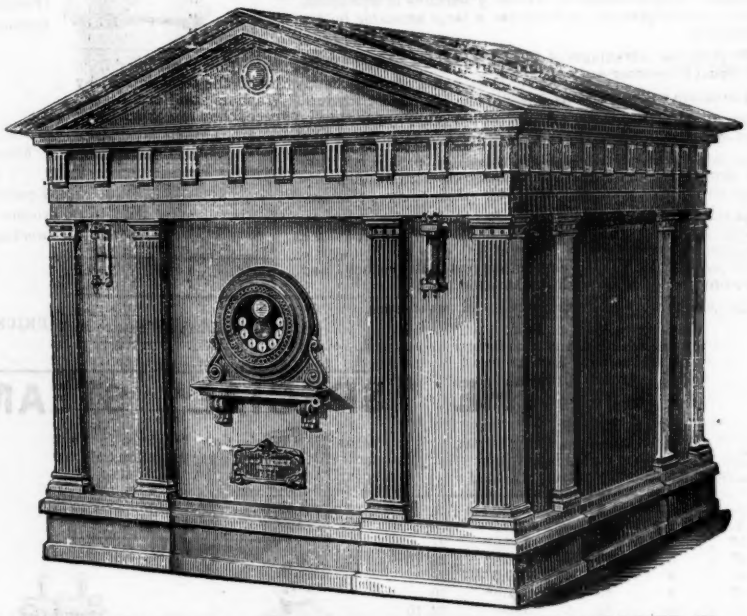

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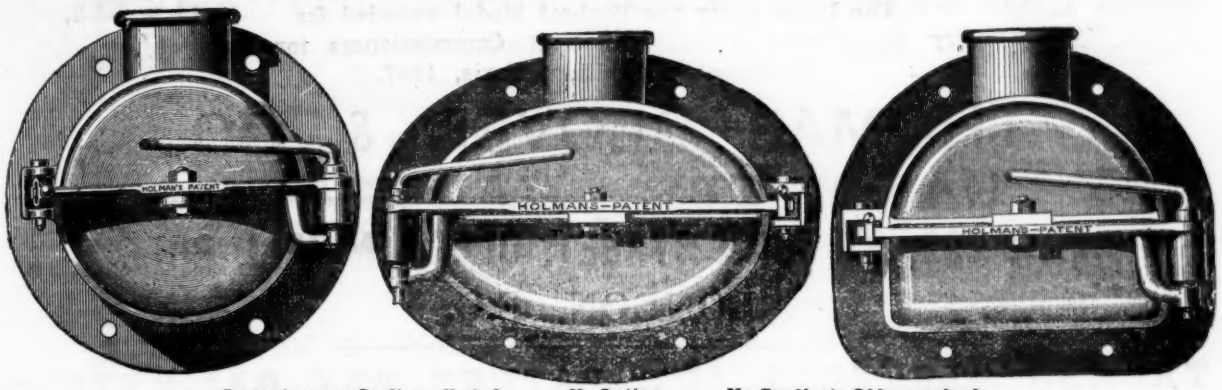

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In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

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It is self adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

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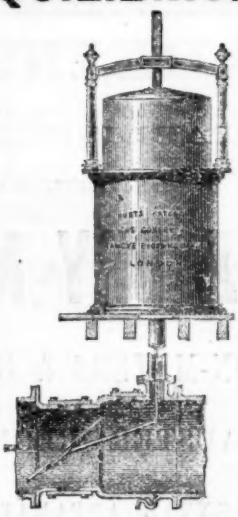
There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

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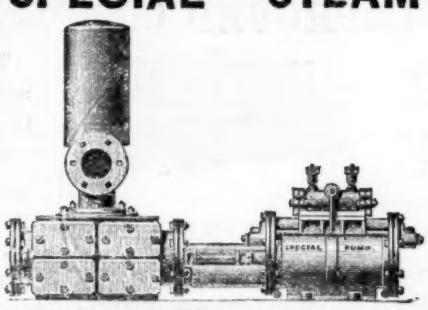
5*	2½	12	1,250*	21
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



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10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

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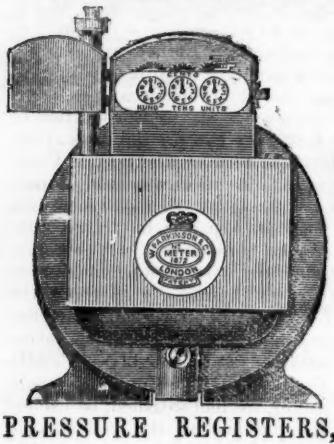

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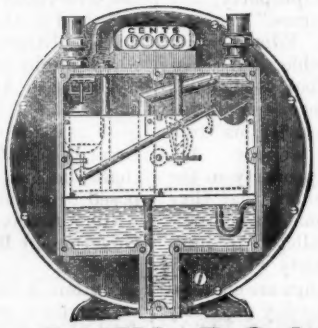

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Covers for binding the Volume (No. XXXIV., July to December, 1879) may be had, on order, from any bookseller, or direct from the office—price 2s. 6d. each.

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TO CORRESPONDENTS.

A. T., and C. R. J. PEPYS, Aix-la-Chapelle.—*Your letters were received too late for them to appear in the present number.*

ENQUIRER asks: *Would some of your readers kindly inform me if it is an infringement of the Aitken and Young patents to re-heat by any means the products of distillation after leaving the ascension pipes, other than by volume of gas in course of manufacture?*

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 27, 1880.

Circular to Gas Companies.

WE hope that the authentic reports which have arrived from New York of the complete failure of Mr. Edison's latest invention will reassure the possessors of gas property, and induce them to retain their holdings. A "scare" such as that produced by the announcement of Mr. Edison's last pretended discovery was perfectly unreasonable. We last week expressed an opinion that, after all, but few shares had changed hands; but that one should have been transferred in consequence of the flimsy reports which reached us from the other side of the Atlantic, is to us a wonder. Are the owners of some of the most substantial property in the kingdom so nervously sensitive to every rumour, that they must rush into the market with shares the moment some new discovery in the use of the electric light is alleged to have been made? We can well understand the anxiety which may prevail among small investors whose whole savings are engaged in gas manufacture, and to these we would to-day expressly address ourselves. We will admit the possible perfectibility of the electric light for both public and private illumination, but when will perfection be arrived at? In the course of the next half century it may be conceded that great improvements will be made in the generation and distribution of the electric force, but will they affect the consumption of gas? Certainly not. Each illuminant will have its special function, and the part played by gas will, of the two, be the more important. It lends itself to household purposes in a marvellous manner. Is heat required for cooking or warming, it is only necessary to turn a tap, apply a light, and the thing is done. Heat and light can be continued as long as they are wanted, and can then be shut off. Electricity, at all events so far as at present developed, offers no such advantages. If light be required, it must be distributed over a whole establishment, or cut off entirely; if heat be wished for, the coming inventions are still *desiderata*. In any case, gas shareholders have but one course to pursue. They must adhere to their holdings, notwithstanding whatever sensational telegrams may come from America. We may very safely prophesy that ten per cent. will, for long years to come, be the divisible profit of all the Metropolitan Gas Companies.

The Corporation of Dublin are not making much by their unreasonable opposition to the Gas Company. The Corporation requested the Company to continue the supply of gas to the public lamps for three months; but, for so short a time, the Company reasonably object to do so at old rates. They do not propose to increase the charge for gas, but as the whole of the plant is their property, and the use of it has hitherto been given gratuitously to the Corporation, the Company now announce their intention, if a contract for less than twelve months be entered into, to make certain charges for meters, lighting and extinguishing, repairs, &c., which in the aggregate will amount to £1 2s. 6d. per lamp per annum. It cannot be denied that the Company are perfectly justified in standing out for their undoubted rights. They have behaved with great liberality, and have been the victims of base ingratitude. The wild talk of some members of the Council, who suggest that application should be made to Parliament for power to light the city, at all events within the municipal limits, is pure bravado. Parliament would never give them such powers. The Corporation may, if they please, go to arbitration as to the charges of the Gas Company; but one member of the Town Council shrewdly remarked that he did not know where arbitration might land them. It seems to us, however, that to arbitration the Corporation must go, or agree at once to pay the new terms announced by the Company. As regards the purchase of the Company's undertaking by the Corporation, we imagine very few indulge in dreams of the kind. Comparisons are said to be odious, and to some they must be. When Corporation affairs in Belfast are made a topic of discussion in the Town Council of Dublin, the different conditions of the one thriving and the other decaying Municipality cannot fail to be recognized. If the Corporation of Dublin really wish to do the best they can for the ratepayers, they will immediately offer to make terms with the Gas Company, and seek no longer to enter into an unwise and impossible competition. The undertaking of the Alliance Gas Company can, of course, be had at a price; but what that price may be we shall not hazard a conjecture.

The Town Council of Hanley are wisely endeavouring to come to terms with the British Gas Company respecting the Bill which the Company will presently introduce to Parliament. So far as we can see, the objects of the Corporation are not of a revolutionary character, and probably a friendly colloquy between the Town Council and the Company would set all matters straight. It would, we feel satisfied, be useless for the Council to attempt the purchase of the undertaking without the preliminary consent of the Company; and this, we gather from a letter read at the last meeting of the Council, they are not likely to obtain. However, everything and everybody has its or his price, and we should not be surprised if the Town Council offered sufficiently good terms for the Etruria undertaking of the British Gas Company, which might be passed into their hands.

The Local Authority of Stone and the Gas Company are at loggerheads. So far as we gather, the Company supply very good gas, and do not charge an exorbitant price for it. The Local Board would, nevertheless, appear to be anxious to purchase the gas undertaking, and the Company are not undisposed to sell at a fair price; but this the Local Board are not willing to give. They have, therefore, applied to the Local Government Board for a Provisional Order to authorize them to set up competing gas-works; although probably the real intention of the Board is to use the Order, supposing they get it, as a lever in compelling the Company to sell their works. Such tactics rarely, if ever, answer, and we think they are certain to fail in this case. Whether the Order will be granted

or not we cannot say; but we imagine that its issue would be a manifest violation of the Public Health Act. Stone, it must be admitted, is now supplied with gas of a good quality, and at a not excessive price; so that there are very sufficient reasons for refusing permission to set up competing works. The only other question is that of purchase. The Local Board are well acquainted with the terms on which the Company propose to sell. Let them set to work and strike a bargain.

The Midland Association of Gas Managers held, on Thursday, the 15th inst., their third annual meeting, under the presidency of Mr. P. Simpson, of Rugby, whose Inaugural Address will be found in another column. It cannot be questioned that these provincial Associations are doing much useful work, but we are free to confess that their relationship to what is called the parent Association is not quite clear to us. If we regard them as Committees of the parent Association, we do not find that they provide much for what we may call the great parliament of gas managers, which meets once a year in London or elsewhere. In our opinion, the object of the local Associations should be to prepare and elaborate communications to be presented at the annual meetings of the parent Association. This would not, of course, prevent discussion, but would, indeed, encourage it. We welcome, therefore, with the highest satisfaction, the multiplication of these provincial Associations, not the least useful of which is the Midland Association of Gas Managers.

Water and Sanitary Notes.

We understand, although no specific statement to the effect has been made, that all the Metropolitan Water Companies have come to an agreement with the Government valuers. The information is at present unsupported, but it may be considered as correct. The terms which have been agreed upon have not yet been made public, and are not likely to be until the Bill which will embody them is laid before Parliament. We, who have so often speculated as to the value of the Metropolitan water undertakings, shall not here again make any remark upon the matter. It was a question, in the first place, for the Government to consider, and that consideration appears to have been given. In such decisions as have been arrived at it must be inferred that the Directors of all the Companies have concurred. But now will come the crucial test—will the Shareholders, backed up as they certainly will be by a powerful party in the House of Commons, support the policy of their Directors? The Government valuers have, no doubt, given full heed to all the circumstances which affect the financial position of the undertakings. They have at this moment a value represented by expended capital, and they have, further, a prospective interest in a continually increasing business. The valuation of the expended capital is a very simple business; but the sum to be paid for prospective profits is a matter which must engage serious consideration. Mr. Cross, in the answer he gave to Mr. Fawcett, obviously intended to insinuate that no consideration would be given for prospective profits. The position taken up by the Home Secretary was clearly untenable; and whatever may be the terms arranged, we may feel satisfied that, in estimating the value of the separate undertakings, prospective profits have entered into the calculation. Further than this, we may assume that due consideration has been given to the value which attaches to the undertakings to-day. If the Companies do not obtain the terms to which they believe themselves entitled, they alone will be to blame. United action on the part of all the Companies could have effectually defeated any measure which the Government might have brought against them. We are far from saying that the action the Government will take must necessarily be antagonistic to the interest of the Water Companies. All we wish to insist upon is that due recognition must be made of all the elements of value which attend the purchase of such undertakings.

The Liverpool Town Council have held a final statutory meeting, at which they decided to go on with the Vyrnwy scheme and its accessories. A little misunderstanding has occurred, inasmuch as it was in the first place announced that the execution of the scheme would cost only a million and a quarter sterling. This was the amount put before the ratepayers when they voted for the promotion of the Bill. But in the Bill power is sought to borrow three and a quarter millions, and some of the Council affect to believe that the ratepayers were deceived. The fact, however, is that the works planned for the Corporation will be executed in three sections, the first of which will cost the million and a quarter which the Council announced would be necessary. When the scheme in its totality is proceeded with, the cost will be brought up very nearly to the sum which the Council seek power to borrow. We may take it, however, that much of the money will not be required for years to come, and that before the second and third sections of the work are put in hand, the first will have become remunerative. In the meantime it seems inevitable that some burden must fall upon the ratepayers in order to provide interest on the capital borrowed. So far, then, as Liverpool is concerned, we may take it that the Vyrnwy scheme is now perfectly safe. What opposition the Bill will have to encounter when it gets into Parliament we do not know. We have a strong suspicion, however, that external opposition to it has collapsed, and that it will meet with complete success.

The Corporation of Bradford do not appear to have made the best use they could of their water undertaking. Years ago they left a good portion of their limits without a supply. To provide for the wants of those districts, a limited liability Company came forward, who, taking water in bulk from the Corporation of Bradford, distributed it amongst several outtownships. Among these was that of Idle, which, it seems, lies rather high, and great complaints are made that the works of the Company are altogether inadequate to furnish an efficient supply. The Company had from the Corporation of Bradford a lease for fourteen years, which has just run out, and here the Local Board of Idle step in with a proposal to purchase the plant of the Company, we presume at a valuation. The Company, however, object to sell, and contend that under their arrangement with the Corporation of Bradford they are entitled to a renewal of the lease. The latter body, however, now themselves propose to supply water direct, and in all probability we shall hear of litigation between the three contending parties. Without a knowledge of the precise details, we may hazard an opinion that the right lies with the Calverley Company, who are now in possession.

MICROSCOPIC EXAMINATION OF SEWAGE AND SEWAGE MUD.

Quite independently of the direct bearing of the result in reference to the arbitration now pending between the Metropolitan Board of Works and the Conservators of the Thames, as to the origin of mud-banks in the river, there is one leading feature, in the evidence lately given in the case by Dr. Tidy, which is interesting to all who wish to know the state of our rivers, and especially to the dwellers in the Metropolis, whose water is derived from the Thames. We allude to his minute and exhaustive microscopic examination of sewage and of mud taken from various parts of the river. We are not aware of any investigations in this direction, and certainly, if there be any, they fall very short of these in completeness and interest. Dr. Tidy's evidence was illustrated by a series of beautiful drawings, showing, with singular clearness and definition, all the main facts observed. It may be well to state that the microscopic powers used were generally high, and sometimes the highest available for such work.

The nature of the suspended matter in true sewage, as determined by the microscope, was established by the examination of nine samples, five of them fœcal, three from sewers, and one from the sewage mud-bank at the northern outfall at Barking. In each case a small piece of the mud was taken, and well stirred with a glass rod in a conical glass. The mixture was left at rest for a considerable time, varying from one to three days, and then a drop of the topmost layer was taken off with a pipette, and placed under the microscope. This method was adopted throughout, in all the experiments, both on sewage and sewage mud. The first point noticed in fœcal matter and sewage was the invariable presence of a quantity of brownish-yellow flocculent matter in patches or irregular-shaped masses. This amorphous material Dr. Tidy attributes to the presence of animal matter that has undergone or is undergoing putrefactive change. It corresponds with decomposing animal matter derived from disintegrated muscle obtained from the dissecting-room. Examined with the highest power obtainable (the fiftieth of an inch), it never loses its amorphous character, it never reflects light, and it presents no indication whatever of mineral origin. It differs from decaying vegetable matter in the total absence of fibrous structure or fibrous texture. Vegetable cells are recognized as having always a clear pellucid outline, and becoming lost entirely when they suffer disintegration. They do not appear to approach this flocculent state under any conditions of change.

The next thing observed in these specimens was the presence of vegetable cuticle marked with small dots in the cells,

and of spiral vessels, the spiral remaining intact after the cell wall had been destroyed. This condition is believed to be a proof that the vegetable matter has been partly digested, and therefore has passed through the alimentary canal. It is peculiarly characteristic of sewage. The presence of diatoms is common; but these are not specially characteristic of the origin of the material, as they occur in all river mud, though more abundantly in sewage.

Portions of muscular fibre come next under notice. Dr. Tidy says: "In all the specimens, without a single exception, "of true sewage I have examined, I have found pieces of "striated muscle, generally very small, sometimes somewhat "large." There were also pieces of animal structure somewhat granular, of yellow colour, which, by repeated observation, have been proved to be striated muscle converted more or less completely into adipocere. Specimens were found in which the two structures were combined.

The following, then, are the conditions characteristic of fœcal matter and undisputed sewage:—(1) Vegetable cells in small clusters; (2) spiral vessels, with or without investing membrane; (3) striated muscle; (4) muscular tissue passing into adipocere; and, lastly, perhaps chiefly, yellowish-brown flocculent patches.

Applying the knowledge thus obtained of the microscopic features of sewage, Dr. Tidy examined in succession mud from the Thames banks near the sewage outfall, mud from the banks and bottom of the river at various points up to Westminster, other specimens from the river between Westminster and Teddington, and others from the bed of the river from Teddington to Windsor. He also examined the alluvial deposit forming the banks of the river at various points, and technically known as "saltings."

The specimens for examination were numerous. Five were taken between Erith and Bugsby's Reach (a distance of nine miles), and eight between Blackwall and Hammersmith (sixteen miles). Beyond Hammersmith, as far as Windsor, others were taken, and a few from the Rivers Wey and Mole. In this way the whole history of the river mud from Erith to Windsor may be said to have been investigated in the course of the inquiry. The mud taken from the lower reaches near Erith contained much granular amorphous matter of a yellowish colour, spread somewhat uniformly through the whole. Amongst it were dispersed imperfect vegetable fibre and spiral vessels, the whorls being loose, some yellow masses closely resembling portions of fascia, and disintegrated muscle, and many diatoms. In a specimen from Woolwich Reach there were the same yellowish amorphous and granular deposits, and several yellow masses, one of which was undoubtedly composed of muscle. There was also vegetable matter consisting of fibres in process of disintegration, and perfect vegetable cells, but no spiral vessels. Diatoms were present, but they were mostly of small size and fusiform. In the next sample, taken higher up the stream, the flocculent yellow matter remained, the vegetable matter consisted only of fibre, and was in small quantity, the diatoms were large and varied, and there were very many yellow masses distinctly animal. Still higher up the river another specimen showed a very similar condition. As far up the river as Woolwich Reach, Dr. Tidy states that he found in every specimen of mud that was taken all the characteristic products of sewage except muscle. He found a small piece of muscle in one; but, as a whole, the muscle in that bank had become entirely converted into yellowish masses. Farther up the river, from Blackwall to Hammersmith, all the eight samples taken showed distinct evidence of sewage; but, in the absence of large pieces of striated muscle and fibrous tissue, and also of spiral vessels, this series presents a marked difference from that collected in the river below Blackwall.

Proceeding farther up the river, Dr. Tidy noticed results which he attributes to a sorting process constantly going on. It is quite certain that when the mixed products conveyed through the sewers into the river enter the stream, the heavier bodies will be the first to sink, but those of which the specific gravity is little above that of water will long remain in suspension, undergoing change, while much of the heavier animal matter may be long retained in a buried state under water, comparatively unchanged. The muscular tissue thus buried will be gradually converted into adipocere, while the lighter portions floating will become disintegrated and oxidized. It may be assumed that wherever the inflowing tide of salt water meets the downward flow of fresh water of the river, and checks its progress, there will be comparatively still water, in which the floating matter will sink. The position of this belt of dead water must be constantly changing with every tide, and approaching the bottom, which it reaches at Teddington. Thus there may be expected to be a deposit of organic matter due to the sewage that is poured into the river at the sewage outfalls, the amount of the deposit gradually diminishing in quantity up to this point, and the nature of the deposit changing to some extent. Such a deposit appears actually to have been observed. Above Deptford Creek the quantity of amorphous granular matter is diminished, and that of grit or mineral matter increased. Within the limits of London, in a sample taken opposite the Houses of Parliament, the deposit was found to consist chiefly of angular fragments of mineral, though with some yellow amorphous deposit and a few diatoms. Higher still, between Chiswick and Teddington, all evidence of sewage, except the yellow amorphous matter, disappeared. Above Teddington there was scarcely any yellow flocculent matter, no distinct organic matter, but a few diatoms, and only one or two vegetable cells; and at last, as we go farther on, no traces of organic matter and no diatoms were found.

The disappearance of the indications of sewage in the mud at the bottom of the Thames from Erith upwards is gradual, regular, and very striking. At first there is everything that the sewers themselves contain. By degrees the more distinct, the heavier, and the more evidently animal products become fewer, and at last disappear. Above Chiswick the yellow amorphous matter alone remains. To use Dr. Tidy's words: "First we lose muscular tissue, next we get no yellow masses, "and at last we get nothing at all. The last vestige of "sewage matter in the mud, which is the yellow flocculent "matter, altogether disappears." We may add that the examination of the alluvial matter forming the banks of the Thames was found by Dr. Tidy to be absolutely free from any indications of sewage.

It is extremely satisfactory to find from this investigation that the Thames water above Teddington is free from any taint of sewage as indicated by the presence of sewage mud at the river bottom. That sewage matter enters the river as it flows through the land and passes towns and villages there is no doubt, and we know the water holds in solution a certain quantity of organic matter. But this is not in itself injurious, and it is clear that whatever be the distance and time required to oxidize organic matter thrown into the water as it passes the towns on its banks, and held in suspension, it has been oxidized and got rid of before the Thames reaches Hampton. The absence of all sewage indications in the mud is the best possible proof—perhaps the only satisfactory proof—that whatever distance and time may be required for this change, they exist and have done their work. In this respect there is no doubt that Dr. Tidy's investigations are of great value, and confirm what had been otherwise proved by analysis.

The presence of distinct fragments of muscular tissue buried in the mud of sewage-banks, and passing into adipocere when they do not undergo a second putrefaction and become decomposed, is another fact of great interest. Once converted into adipocere, it is difficult to imagine anything more harmless; but preserved, as they appear to be, for a considerable time subject to putrefactive fermentation, and only half converted, they are certainly sources of great danger. In cold weather putrefactive change is retarded, and the sewage mud is inert and unchanged; but when hot, dry weather occurs, and the mud-banks are exposed during certain times of tide, it is well known that the smell is powerful and offensive. There can be little doubt that in such a state there will be malarious emanations involving much danger to health. When it is known that such mud-banks consist to a certain extent of half-decomposed muscle, and are full of what are called blood-worms, characteristic of sewage, the danger of allowing them to accumulate must be evident.

Thus from every point of view, both as regards water supply and sanitation, the microscopic investigation of sewage and sewage mud is eminently worthy of our close attention, and we have to thank the Conservators of the Thames for causing this part of the inquiry now going on to have passed into the hands of one who is so competent to do justice to it as Dr. Tidy has proved himself to be.

YESTERDAY'S PRICES OF GAS AND WATER SHARES.—Mr. A. G. Prater, Stock and Share Broker, of 23, Cornhill, gives the following as the closing prices yesterday of some of the principal gas and water shares:—

Gas Companies.			Phœnix	35	— 36
Commercial	179	—182	South Metropolitan	192	—197
Continental Union	17½	— 18½	Do. "B"	180	—185
Do. 7 per cent. pref.	22¼	— 22¾	*Water Companies.*		
Crystal Palace District	170	—175	Chelsea	184	—188
Crystal Palace 6 per cent.	120	—123	East London	193	—196
Do. 7 per cent.	124	—127	Grand Junction	114	—116
European	17¼	— 18½	Kent	260	—265
Gaslight and Coke "A"	179	—181	Lambeth	194	—197
Imperial Continental	178	—180	Southwark & Vauxhall	187	—190
London	175	—180	West Middlesex	172	—175

THE PROPOSED BRITISH STANDARD WIRE AND PLATE GAUGE.

We have received a copy of the Report of the Committee of the Society of Telegraph Engineers on the Birmingham Wire Gauge;* with which is bound a reprint of the paper on the unit of the B. W. G. by Mr. C. V. Walker, F.R.S., and the two papers of Mr. Latimer Clark, M. Inst. C.E., read by him before the British Association at Dundee in 1867, and at Exeter in 1869, the whole forming an exhaustive summary of the existing state of knowledge of the B. W. G. itself, and of the most promising methods of rectifying it, or supplanting it with some other form of gauge which shall have a distinct basis, and therefore be capable of reference to fixed data, and be suited also to the requirements of the workmen, traders, or men of science of all countries. The arbitrary progression of the numbers of the B. W. G. must have been remarked by every person who has had to deal with it, either for wire or plate metal. The reasons for their existence must have been puzzled over in a more or less desultory fashion by numberless observers, and are a mystery to the great majority of those who have the numbers themselves constantly in their minds or on their lips. And, as will be seen, on perusal of the pamphlet under notice, the mystery is one that does not tend to diminish when examined closely.

The first question that would naturally arise in the course of a discussion on the B. W. G. would be—What *is* the B. W. G.? And that is apparently a question to which no satisfactory reply is now possible. Of course, it may be generally answered that the B. W. G. is a system of numbers by which it has been customary to describe the relative thicknesses of iron or copper sheets and wires. But such an answer is only shifting the difficulty one stage backward, for nobody knows what the numbers mean, or how to replace the existing gauges if they should all be destroyed. We know exactly what is meant by a yard or a mètre, and if every existing standard were to be destroyed to-morrow, the inconvenience would only be temporary; but in sheet ironwork the important third dimension is stated in terms which no two persons could be compelled to read alike. As a matter of fact, the only legal measure of thickness for sheets or wires in England is the standard measure of length; but that system of measurement would frequently be cumbersome in such cases, and is rarely used in ordinary transactions. Wire is frequently described in terms of standard weight per standard unit of length; but sheets are known only by their number of the B. W. G., except when they can be measured by some simple subdivision of an inch.

The diversity of opinion respecting the true value of the numbers of the B. W. G. is well shown in several tabular statements given in the pamphlet before us. In a list of thirteen authorities, the equivalent measurement of such an ordinary gauge as No. 10 is different in nine cases; and, as one authority omits it, only three are in precise agreement. The measurements vary from 0·140·6 in. to 0·126 in., which is about equal to an average No. 29 B. W. G. in this size alone. Other examples of glaring discrepancy are common; notably, the common No. 16, which only appears in its ordinary acceptation of 1-16th of an inch in two out of the thirteen lists, while it is as hard to determine whether No. 10 or No. 11 should be considered as equivalent to what is known as 1-8th plate. In the report itself, it is stated that "four or five different gauge plates have been made for one maker—some by which the workmen are paid, and others by which the wire (or plate?) is sold."

The use of half or quarter sizes has not come into use among consumers, but they are not unknown to makers, who, however, in their dealings generally forget to mention the fractional quantity. In wire for electrical purposes, some of which is necessarily extremely fine, and in which exactness of diameter is of the first importance, the uncertainty of the ordinary B. W. G. is, as we have said, of sufficient moment to necessitate the use of terms of weight in proportion to length; but this is a clumsy expedient. In sheet iron, with the measurement of which Gas Engineers are more particularly concerned, the variations of thickness are chiefly of interest for the differences of weight and value which arise from them, and as the ratio of weight to area cannot conveniently be used in the determination of the third dimension, the inconvenience of an uncertain standard becomes very obvious.

The conclusion respecting the origin of the B. W. G. to which the report gives credence—viz., that the original gauge was the outcome of the practical necessities of wire-drawing in the last century, No. 1 being the original rod, and the following numbers signifying the number of "draws" to which the iron had been subjected—is possibly the most reasonable origin to which it can be referred, and the practical element in such a standard was doubtless the cause of its universal adoption. The general indifference displayed to accurate measurements at that period, or the difficulty of making them, with any degree of exactness, of such minute objects as the diameters of small wire, is sufficient to account for the fact that no authoritative record of the average or correct equivalents of the numbers is known to be in existence. The discovery by Mr. C. V. Walker of the occurrence of the constant denominator 640 in the fractional equivalents of a gauge made by Messrs. Johnson and Nephew, led Mr. Latimer Clark to the belief that some such determination was at one time made by some practical mechanician, who started with multiples of 64ths of an inch for the gradations of the larger sizes down to No. 12 or No. 13, and then, this being too great, the denominator was multiplied by 10, and the same system of reduction was carried on. This would bring the adjustment down to the 640th part of an inch, or No. 39 B. W. G. on that system. Unfortunately, there is no adequate ground for believing that the actual gauge referred to is any more an exact presentment of the original draw-plates than any of the others, which differ from it in a conspicuous manner, although it preserves intact the simple fractional values of the fundamental gauges, Nos. 11 and 16 and others. But at its best there are discrepancies in it which destroy its claim to uniformity, and its dependence on the standard inch as to its basis would be a grave obstacle to its adoption in countries whose standards of length differ from our own. True, the conventional B. W. G. is used in countries where the standard is the mètre, but that is merely because of the persistency with which we have ourselves adhered to it. It is doubtful, however, whether they would be equally willing to adopt a new gauge which, with a few improvements, still retained what to them must be an objectionable feature. And it is not probable that we shall always retain our old standards of length, to the exclusion of the more simple metric system. Hence the thing to be sought appears to be a gauge of which the graduations shall proceed in regular progression, independently of any arbitrary unit of length for the diameters or thicknesses, but based upon a regular increment or diminution of weight, which will hold good under all circumstances. If such a gauge can be constructed sufficiently near to the existing gauges to supplant them, without much disturbance of the experience of mechanics and traders with the old numbers, it is evident that a great element of uncertainty, annoyance, and loss will be in a fair way of removal. Fortunately Mr. Latimer Clark is able to speak positively on these points, and he has proposed a new standard British gauge for all kinds of wire and sheet metal, which has been approved by the Committee of the Society of Telegraph Engineers, and is recommended by them to the consideration of all persons interested in the matter, with a view to its ultimate adoption by the Board of Trade.

The report has the following paragraph on Mr. Clark's gauge, and we cannot do better than reproduce it in substance:—

> In 1867, Mr. Latimer Clark proposed a geometrical gauge, in which the intervals are so arranged that each size is exactly 20 per cent. less in weight than the preceding size. By a slight modification of the starting point, making the No. 0 size equal to 1 centimètre in diameter, this gauge follows very closely the sizes of the ordinary B. W. G., while it has the advantages, common to all geometric gauges, that it can be extended indefinitely in either direction for larger and smaller sizes; that a person knowing the weight of any one size can readily calculate the others; that the differences are perfectly uniform throughout; that the half and the quarter sizes can be defined with perfect precision; and that it is equally suited for English and foreign systems of mensuration. Its objections are that, even when defined in mils (thousandths of an inch), it requires in practice at least one decimal place; that the larger and the smaller sizes are both larger than the ordinary B. W. G., frequently differing from them by more than a whole size, though the middle sizes coincide pretty closely.

Further, after expressing in general terms the advantages of a geometrical gauge for a universal standard over any attempt to correct the inequalities of the conflicting empirical gauges at present in existence, the final preference is given to Clark's gauge, on the ground of its special agreement with the B. W. G., from which "it differs scarcely more than the existing gauges differ among themselves."

From No. 5 to No. 18, within which range lies the great bulk of sheet numbers used for gasholders, "the variation is never equal to a whole number." The report says:

> By the use of half or quarter sizes, we have a series of great uniformity, varying about 2½ per cent. in weight of plate or diameter of wire, and about 5 per cent. in weight of wire, and the gauge would, therefore, appear to be well suited for a plate gauge, and especially in the cases of very thin sheets, as there are no sudden jumps in any part of it. Tables of weight of wire and sheet for different metals would become possible, and would enable any of the sizes to be bought and sold by weight, or the thickness checked by the weight. Concurrently with this the system of measurement by thousandths of an inch will be available as heretofore.

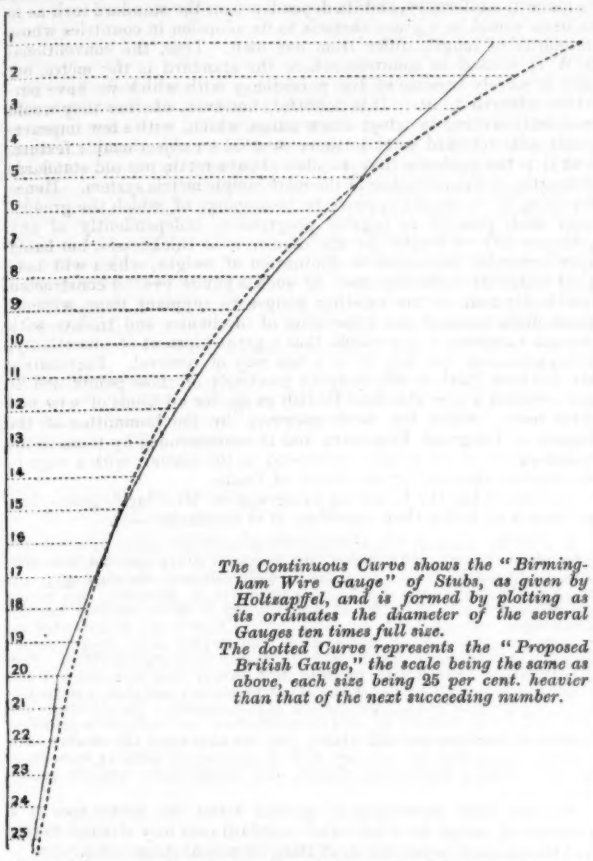
The following table, constructed from data furnished chiefly by the report, shows the principal numbers of sheet iron in common use in gas-works in the usually received equivalents in mils, or thousandths of an inch per B. W. G., and for the proposed British Standard Gauge, or B. S. G., which is also given in millimètres:—

Table of Sizes of Wire and Sheet Iron.

	B. S. G.		B. W. G. in Mils, or Thousandths of an Inch.			
No.	Millimètres.	Mils.	Stubs.	Molesworth.	Spon's Tables.	Whitworth.
0	10·00	393·71	340	—	340	—
1	8·94	352·14	300	310	312	300
2	8·00	314·97	284	280	284	280
3	7·16	281·71	259	260	261	260
4	6·40	251·97	238	240	239	240
5	5·72	225·37	220	220	217	220
6	5·12	201·58	203	200	208	200
7	4·58	180·30	180	187	187	180
8	4·10	161·26	165	166	166	165
9	3·66	144·24	148	158	158	150
10	3·28	129·01	134	137	137	135
11	2·93	115·39	120	125	125	120
12	2·62	103·21	109	109	109	110
13	2·35	92·31	95	95	94	95
14	2·10	82·57	83	83	80	85
15	1·88	73·85	72	72	72	70
16	1·68	66·05	65	65	63	65
17	1·50	59·08	58	56	55	60
18	1·34	52·84	49	49	48	50
19	1·20	47·26	42	42	42	40
20	1·07	42·27	35	35	35	36
21	0·960	37·81	32	32	33	32
22	0·859	33·82	28	28	29	28
23	0·768	30·25	25	25	28	24
24	0·687	27·05	22	22	25	22
25	0·615	24·20	20	20	21	20

* "Report of the Committee of the Society of Telegraph Engineers on the Birmingham Wire Gauge," &c., &c. London: E. and F. N. Spon.

The following is a graphic delineation of the same numbers, showing at a glance wherein the proposed B. S. G. departs from the equivalent dimension of the B. W. G., as given by Stubs. It should be remembered that this measurement of the B. W. G. is the one in general use in America, and differs from the others in the table.



The Continuous Curve shows the "Birmingham Wire Gauge" of Stubs, as given by Holtzapffel, and is formed by plotting as its ordinates the diameter of the several Gauges ten times full size.
The dotted Curve represents the "Proposed British Gauge," the scale being the same as above, each size being 25 per cent. heavier than that of the next succeeding number.

It will be seen that the exact equivalent of 1-8th of an inch for No. 11 B. W. G., which is preserved by Molesworth and in Spon's tables, is wanting in the B. S. G., which makes this gauge much lighter; but the general regularity of the new gauge is very apparent.

There can be no valid objection to the proposed gauge as a standard, at all commensurate with the manifold advantages which it presents, and its convenience if it should be legalized. It certainly requires a number of figures to express its equivalents in decimals of an inch; but that drawback is more apparent than real, for the only occasions when the equivalents are required—for example, when the strength of sheets is to be computed—are comparatively infrequent, and in such cases the use of an additional decimal place or two is unimportant, or, from the smallness of its practical value, may be neglected. The weight of sheets rolled in accordance with it will be taken from tables, as with the present system, and the transition period, when some little confusion might be expected, would not be a very long one. In every way, as offering regularity for chaos, rationality for empiricism, and universality by right for acceptance by force of custom, this British Standard Gauge appears to deserve the approbation of the public and the sanction of the Government. But if it is to be finally adopted, let it be imposed compulsorily or not at all. There is already too much confusion for any new system, however good, to be introduced with any hope of ultimate sanction by the action of the "survival of the fittest" principle, for in that way the existing perplexity will only be aggravated. It is not advisable that any ill-considered action should be taken in such an important matter. Let it be well sifted in all possible ways now, while it is *in nubibus*, and when its sponsors may combat any objections that can be raised, or modify it in any manner that may be considered advantageous—when independent authorities, with other applications of it than for wire in their minds, shall have had time to analyze it carefully; so that when it becomes law there may be a sufficient consensus of opinion to support it, and to ensure its propagation from the stand-point of a British measure, into the universe of commercial and engineering enterprise, in connection with which its greatest utility will have to be shown.

It is stated that, subject to audit, the accounts of the Chartered Gas Company for the half year ending on the 31st ult. show profits sufficient to justify the Directors in recommending a dividend on the ordinary stock at the rate of 10½ per cent. per annum.

Sale of Gas and Water Stock at Preston.—On Monday last week Mr. H. C. Walton offered for sale £537 worth of B stock, fully paid up, of the Preston Gas Company; and £350 worth of consolidated A stock and £463 B stock of the Fylde Water Company. The Gas Company's stock realized 137 per cent.; while the A stock of the Water Company was disposed of at par, and the B stock at the rate of 92 per cent.

WATER BILLS FOR 1880.

In noticing the Water Bills which will be presented to Parliament in the ensuing session, we leave out of consideration the works they are intended to authorize. "Limits of "deviation," too, are no concern of ours. As regards rates and charges, we mention them whenever they present any novelty; but, as a rule, they are now so universally established that scarcely any new feature presents itself.

The two following Bills are promoted to incorporate Companies for the supply of water in the districts mentioned in the Bills:—

The *Dearne Valley Water Bill* proposes to incorporate a Company with power to supply with water Hoyland and a number of other parishes in the Valley of Dearne, in the West Riding of York. The source of the water is to be a well or wells in the parish of Bromhill, presumably in the sandstone. The capital of the Company is to be £30,000, with power to borrow to the customary extent. This power is to be exercised rateably as the capital is issued. The charges for the supply of water are about what are commonly levied, but we notice that extra closets, &c., are to be charged for at the annual rack-rent, not, as usual, at a fixed rate. The limits of the undertaking are closely surrounded by those of some corporate bodies, so we are not surprised to find that the Company propose to restrict themselves from supplying water in bulk beyond their boundary.

The *Portmadoc Water Bill* is to incorporate a Company to supply water to several Welsh townships, the names of which we might transcribe, but would not presume to pronounce. The Company obtained a Provisional Order from the Board of Trade in 1871, but as the wants of the neighbourhood are constantly increasing, the Company are seeking incorporation, with power to add considerably to the works originally belonging to them. The capital of the incorporated Company is to be £16,000, of which £8500 is to be called "original." The usual borrowing powers are prayed for in respect of both classes of capital. The Company have selected as the source of supply a lake, the waters of which they propose to impound by extensive works. The ordinary rates for a domestic supply are much as usual, but the charges for extras are higher than those which generally obtain. Power is asked to supply water in bulk.

The *Sea Water Supply to London Bill* has already been noticed in our columns, and need only be briefly referred to now. A number of gentlemen propose to start a Company who will erect a pumping-station at Lancing, in Sussex, and then by a conduit, following a rather devious route, will bring the water of the English Channel to Fulham, from which place it is intended to distribute it among the aristocratic inhabitants west of Charing Cross. Sea water in London will no doubt be considered cheap at 10s. per thousand gallons. How many thousand gallons will be required to supply a West-end mansion for the time it is occupied in the season we shall not undertake to say; but supposing the water to be supplied by meter, we may take it that the consumption will be small. The capital proposed for the Company is £184,000, with borrowing powers to the usual extent. It is a remarkable fact that the Company have not limited themselves to a ten per cent. dividend. The mystification of preferred and deferred half shares is here put forward, but with what intention nobody can tell.

The Bills promoted to confer further powers on Water Companies already incorporated are as under:—

The *Cardiff Water Bill* is intended to correct certain oversights in the Corporation Water-Works Act of last year, which concerned the division of the purchase-money.

The *Exmouth and District Water-Works Bill* is to confer further powers upon the Exmouth and Budleigh Salterton Water-Works Company. The Company were formed in 1864, with a capital of £8000, with power to borrow £2000. By the Bill authority is sought to raise a further sum of £17,200 by the issue of shares and stock. The Bill also asks for power to borrow £5000.

The *Great Yarmouth Water-Works Bill* is to extend the limits of the Company, and to authorize them to raise further capital. The Company were incorporated in 1853, and by the Act of that year, and by subsequent enactments, they have been authorized to raise capital to the amount of £120,000, with borrowing powers to the extent of £26,000, nearly all of which has been called up and expended. By the Bill authority is sought to raise a further sum of £80,000 by the issue of shares or stock, with power to borrow to the usual extent.

The *Southwark and Vauxhall Water Company's Bill* has been repeatedly noticed in our columns. It seeks ambitiously

to obtain for the Company power to amalgamate with any one or all of the Metropolitan Water Companies, and further to raise additional capital to the amount of £650,000, with corresponding borrowing powers. Perhaps, however, the amalgamation proposals have now been abandoned. It is intended, under the powers of the Bill, to construct some new works. But water affairs in the Metropolis are in such an uncertain state, that it is scarcely necessary to speculate upon the results which will ensue from the presentation of the Bill to Parliament.

The *Wrexham Water-Works Bill* is to enable the Company to construct additional works and raise further capital. The Company were incorporated in 1864, with a share capital of £15,000, carrying the usual borrowing powers. The Act we mention authorized the Company, in the event of the capital not being found sufficient, to raise a further sum of £6000, and to borrow £1000. By a subsequent enactment, passed in 1874, the Company were empowered to raise a further sum of £20,000, and to borrow to the usual extent. By the Bill, power is sought to obtain £60,000 additional capital, with corresponding borrowing powers, and the Company ask for authority to supply water in bulk.

There is only one Bill—the following—in reference to the purchase of a Water Company's undertaking by the Local Authority; of course, excepting that for the acquisition of the London Companies works, which will be introduced as a public measure:—

The *Rochester Corporation Water-Works Bill* is to enable the Rochester Corporation to acquire the undertaking of the Strood Water-Works Company. The Corporation seek authority to borrow £6700 for the purpose of purchase, and a further sum of £7700 for additional works. The rates and charges proposed for the supply of water for domestic purposes are much as usual, although some of the items are lower than ordinary.

The following Bills are promoted in order to obtain for Local Authorities further powers in respect of water undertakings:—

The *Birkenhead Borough Bill* is an improvement measure, which, among other things, is to authorize the purchase by the Corporation of Birkenhead of the undertaking of the Wirral Water-Works Company, now supplying a portion of the borough. The terms of purchase are to be settled by mutual agreement.

The *Cork Improvement Bill*, so far as it relates to water, is simply to empower the Corporation to borrow £30,000 for the improvement of their water supply. The only novelty proposed, if it can be called one, is the issue of coupons with the mortgages, representing one half year's interest. The money borrowed is, of course, to be paid off by means of a sinking-fund. Beyond these provisions, the Bill only seeks some ordinary powers of inspection, &c.

The *Doncaster Corporation Water Bill* is to empower the Corporation to acquire, by compulsion or agreement, additional lands, described in a book of reference, and take for the purposes of their undertaking all water found in, on, or under such lands. No borrowing power is asked for, the Bill simply seeking authority to apply to the purposes of the Act money the Corporation already have power to raise.

The *Edinburgh and District Water Bill* is to authorize the Edinburgh Water Trustees to borrow a further sum of £120,000 for the completion of the works for which parliamentary power has already been granted. The Trustees have been in Parliament for several years, and have raised large sums of money, and by the Bill they seek power to raise money to pay current expenses.

The *Huddersfield Tramways and Improvement Bill* is, *inter alia*, to authorize a considerable extension of the water limits of the Corporation, and to sanction the borrowing of an additional sum of £150,000 for water-works purposes. A power, now commonly granted, is asked, which will give the Corporation the right to inspect wells, pumps, tanks, &c., within their limits, and, whenever it is thought desirable, to close or cleanse them.

The *King's Lynn Corporation Bill* offers the unusual spectacle of a Corporation making an endeavour to contract their limits of water supply by releasing them from a duty imposed by their Act of 1859.

The *Lancashire County Justices Bill* is to authorize the Justices to construct works for the supply of water to the County Lunatic Asylum at Whittingham. The source is to be a spring in a quarry, known as the Mountain Delph. The Justices by the Bill seek power to borrow to the amount of £20,000 on mortgage, and a further sum of £25,000 on security of the county rates. This latter loan probably does not concern the water undertaking, inasmuch as the Bill is intended to find the Justices money to erect courts and lock-ups, which, happily, do not concern us.

The *Liverpool Corporation Water-Works Bill* is promoted by the Corporation of Liverpool to enable them to carry out what is known as the Vyrnwy scheme. This scheme has been so repeatedly noticed in our columns, that it is not necessary to refer to it further in this place. We shall not attempt to describe the works that will be needed to take the water of the Rivers Vyrnwy, Marchnant, and Afon Cowny through the country which lies between their source and Liverpool. Much discussion will yet arise when the Bill comes before a Parliamentary Committee; but we have a strong belief that the Corporation will succeed. To carry out the entire scheme the Town Council seek power to borrow three and a quarter millions sterling, which sum is to be paid off by means of a sinking-fund in the course of 100 years—a period which will give the Corporation ample time, always supposing the borough continues to develop at its present rate, to pay off their liabilities, and realize an ample profit.

The *Oldham Improvement Bill*, so far as regards the supply of water, is to extend the limits of the Corporation so as to include the district of Royston. The Corporation also seek power to borrow £100,000, for the construction of additional works.

The *Rathmines and Rathgar Townships (Vartry Water Supply) Bills* are to confer powers on the Rathmines and Rathgar Townships Improvement Commissioners and the Corporation of Dublin on the one side to take, and the other side to sell, Vartry water. The substitution of the new supply for the old will be a blessing to all interested in the change.

The *Sligo Borough Improvement Bill* is, among other things, to revive the powers for the construction of water-works, authorized by the Act of 1869, which apparently have never been exercised. In 1869 the Corporation obtained power to borrow £25,000. It would seem, however, that they never raised any of the money, and now they wish to borrow £30,000 to do the work for which, in 1869, £25,000 was thought sufficient. Possibly some day Sligo will get a good supply of water; but, at the rate at which the Corporation are now proceeding, it may be a long time first.

The *Stafford Corporation Bill* is, among other things, to authorize a considerable extension of the water limits of the Corporation, and, at the same time, to empower them to abandon certain works which they were authorized to make by their Act of 1876, and construct others better suited to the supply of their borough and limits.

The *Wakefield Corporation Water-Works Bill* is to authorize the Corporation to contract their limits of supply, and construct new works. The limits of the old Company are considerably lessened, and the Corporation will content themselves with furnishing water over a narrower area. The new source of supply is to be an impounding scheme, which is to collect water from the Booth Dean Clough, and certain streams upon the Rishworth Moors. When these works are completed, we hope we shall no longer have the opportunity of seeing the unfiltered water supplied to Wakefield used as writing ink. The works that are now contemplated by the Corporation are evidently extensive, for power is asked to borrow a sum not exceeding £300,000 to put them into execution. The Bill stipulates that the works shall be completed within ten years, and at the same time proposes to authorize the supply of water in bulk to other Local Authorities within or without their limits, and to furnish fittings, &c.

The *Wigan Improvement Bill* proposes to give the Corporation of the borough extensive powers of inspection over both the gas and water supply, the propriety of which we can honestly endorse.

THE GAINSBOROUGH GAS-WORKS AND THE LOCAL BOARD.—An adjourned meeting of the Gainsborough Local Board of Health was held on the Monday of last week—Mr. Bladon presiding—when the question of the propriety of purchasing the local gas-works was again under discussion. Mr. Marshall said the Finance Committee had considered the matter, and did not think it at all expedient to entertain the purchase. He therefore moved—"That it is inexpedient for the Board to purchase the gas-works, on the terms offered, at the present juncture." He said that as it would be necessary to borrow so large an amount of money he did not think the Local Government Board would entertain the purchase, as it would be saddling a future generation with the payment. Mr. Newmarch agreed that it was inexpedient to proceed with the negotiations, and stated that many of the mains had been down many years, and he knew several were out of repair. The Chairman said the question to be decided was whether it was advisable for the Board to go to the full extent of their borrowing powers for what was at most a doubtful speculation. Mr. Marshall said the town had opposed the purchase before, and most probably would do so again. The resolution, having been seconded by Mr. Newmarch, was then carried; so all negotiations will now cease.

Communicated Article.

THE HYDRAULIC MAIN.

By Mr. R. H. Patterson, F.S.S.

Postscript.

In relation to my articles on this subject, I have been favoured with several communications from gentlemen well known in the gas world, and who have given their attention to improving the Hydraulic Main, &c. Among others, I have received a letter from my able and esteemed friend, Mr. G. Livesey, to whom gas manufacture of late years has been so much indebted; and as he permits me to make use of his statement "in my next article or otherwise," I gladly do so, and I am sure it will be read with interest and profit. Mr. Livesey writes to me as follows:—

I read with great interest your articles in the Journal of Gas Lighting, because of their great intrinsic value, and my object in writing to you is to say that if you care to come to the Old Kent Road, you can see the idea recommended by you in this week's Journal [Jan. 13] carried out in such a manner that any one twelve months hence seeing it would say: "You have acted on Mr. Patterson's suggestion."

The hydraulic main is abolished; a self-acting valve is employed; and the gas is conducted into the "new receiving main." The tar is separated from the gas before it reaches the receiving main, and provision is made at intervals of 9 feet in that main for the separation of the tar from the liquor, and its removal from the main. The tar is thus always kept from contact with the gas, being covered with a stratum of liquor which flows with the gas.

The accompanying sketches show the whole arrangement. Fig. 1 shows two receiving mains, one for each side; fig. 2 shows one main and one valve only for each through retort, as an alternative plan; fig. 3 shows the valves; and fig. 4 the bye-pass arrangement for regulating vacuum and checking oscillation.

The thing looks well, but as it has only been at work a week or two I cannot say much about it at present. The self-acting valve, however, I have had at work for three months or more, and it answers perfectly; the valve can be adjusted to lift at any pressure. I prefer working at about 1-10th to 2-10ths in the retort; on no account at a vacuum, as air would be drawn in, to the great detriment of the gas. In order to work with a level gauge in the receiving main, I use at its inlet to the general main a bye-pass throttle-valve exactly the same as is used for the bye-pass of the exhauster to prevent the vacuum getting too high. This also acts so well that I think of applying it to every retort-house, because the vacuum varies according to the distance from the exhauster, giving more in one retort-house than another, and this governor bye-pass enables the vacuum to be kept constant in the hydraulic, whatever it may be elsewhere. The governor is actuated by a small gasholder in the ordinary way.

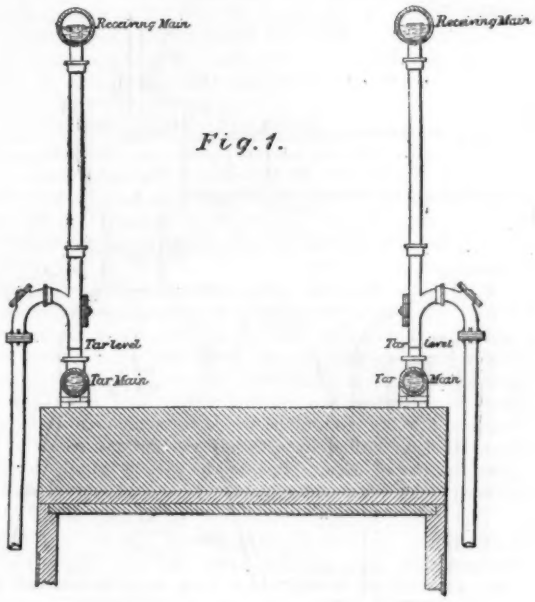


Fig. 1.

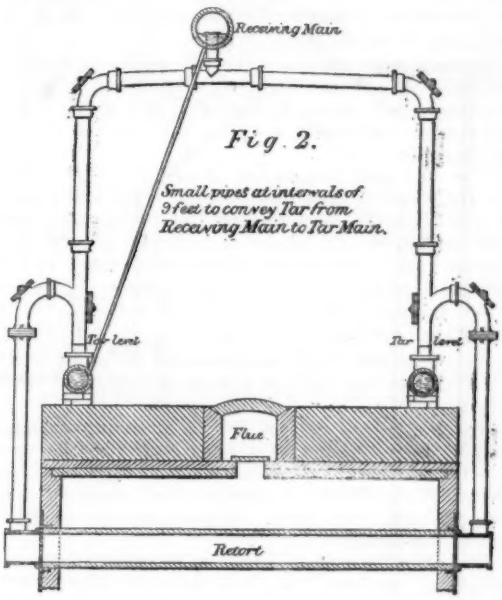

Receiving Main
Small pipes at intervals of 9 feet to convey Tar from Receiving Main to Tar Main.
Tar level
Tar level
Flue
Retort

Fig. 2.

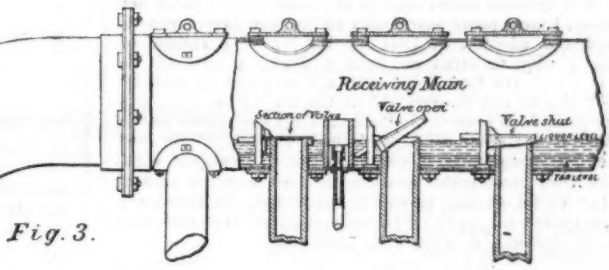


Fig. 3.

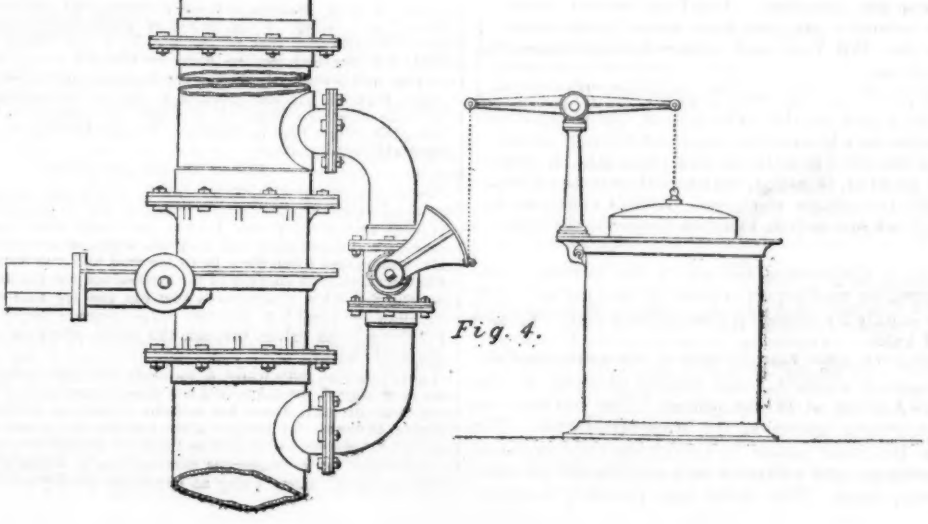
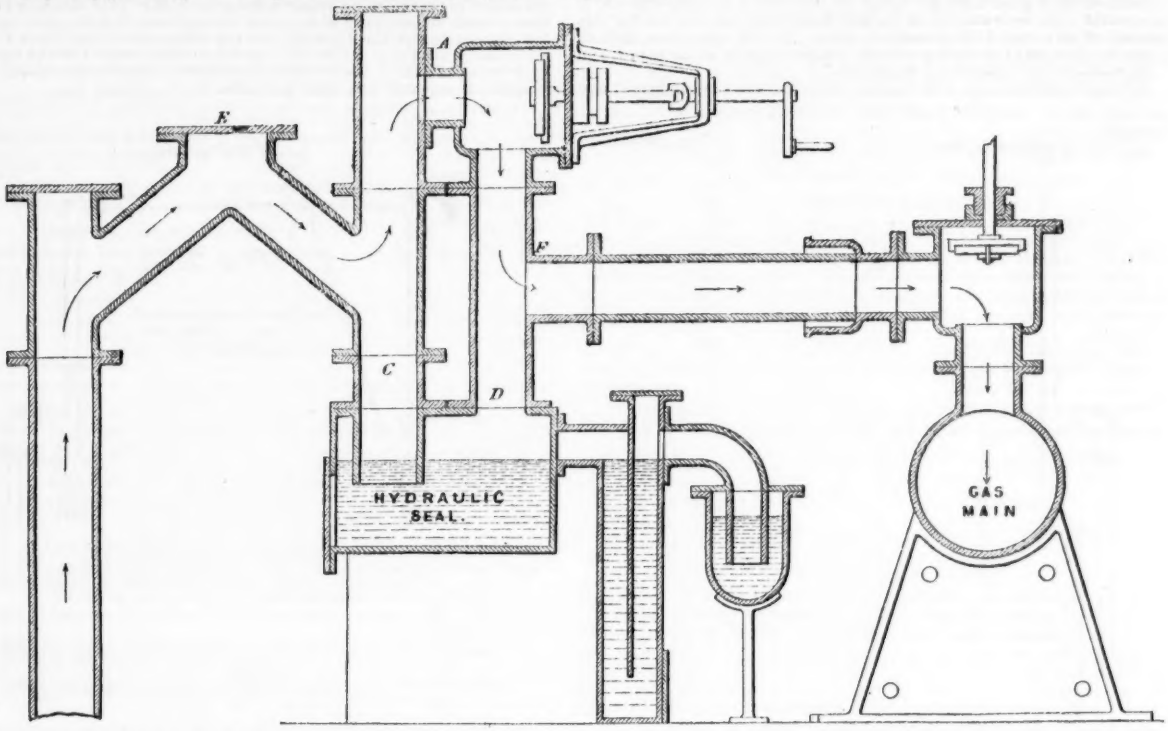


Fig. 4.

As will be seen, Mr. Livesey's arrangements, in some interesting points (as in his mode of applying the force of the Exhausters), go beyond the subject to which I must confine myself—namely, improvements on the Hydraulic Main. From the drawing which Mr. Livesey gives, it will be observed that all the tar formed between the summit of the Ascension-pipe and the top of the pipe which thence leads *upwards* into the Receiving Main must drain down into the Tar Main, and thereafter is entirely separated from the gas: and this is usually by far the larger portion of the tar. In the Receiving Main, however, the tar and liquor are kept at a fixed depth, as in the ordinary Hydraulic Main; and the pipes at 9-feet intervals are simply so many overflow-pipes. If the plates, or whatever it be that keeps the condensed matter at a fixed height in the main, were removed, so as to allow it all to flow down the present overflow-pipes, this would be, I shall not venture to say an improvement, but more in accordance with what I have suggested in these columns. Indeed, by simply cutting off the tops of the overflow-pipes (*i.e.*, the portion which projects up within the main), the whole tar, &c., would be withdrawn at intervals of 9 feet; but, as it seems to me, it would be still better if a narrow trough, say about a foot in depth, were affixed to the bottom of the main, so as to keep the tar out of direct contact with the gas stream. This would very nearly correspond with what I have ventured to suggest.

I have also been favoured with some papers from Mr. White, of Abersychan, descriptive of his Anti-Dip Valve and concomitant arrangements, the value of which, I believe, is becoming recognized by gas engineers. The valve is thoroughly efficient, and as simple as possible—in fact, it is just what Nature adopts in the arteries and veins—opening forwards at the slightest pressure, yet insuperably resisting any back-flow. The gas and tar are allowed to flow together in his Main, which, as already said, I consider is a point to be (and may be easily) remedied; but, I believe, the pipe or main beyond the valve is short, and also *ascends*, so that the tar is quickly got rid of.



While mentioning these improvements of recent date, I must not omit—or, rather, I must recur more fully to the Anti-Dip arrangement patented and adopted in 1851 by Mr. T. N. Kirkham, of which he has kindly favoured me with a drawing. It will be observed that there are two large openings or pipes (C and D) through which the tar can descend, out of the way of the gas; and when the bye-pass, A, is open (as is the case when the retorts are in action), all the tar and other condensable matter deposited between the summit of the bridge-pipe, E, and the point F is entirely withdrawn. But from that point forward the gas and tar travel together. The object of this invention was simply to lessen the back-pressure occasioned by the hydraulic seal; nevertheless, as it happens, it is one of the very best arrangements, even at the present day, for lessening the contact between the gas and tar—a matter not thought of in 1851, or till long afterwards.

I cannot conclude without repeating my regret that the actual effect upon the illuminating power of the contact between the gas and tar *as it occurs in gas manufacture* should still remain so little investigated and ascertained. Mr. White maintains that the results obtained from his Anti-Dip Valve and concomitant arrangement demonstrates the absorptive action of the tar upon the illuminating elements of the gas. And comparing his own works with those in the same locality, where the same kind of coal is used, but where the old "dips" are retained, he says that he finds no difficulty in turning out 15-candle gas, while their gas is only of 13-candle power. So large a gain as this (viz., fully 13 per cent.), and obtained from so simple and costless an arrangement, certainly calls for the investigation and consideration of gas managers. White's apparatus is employed at Maidstone and also at Tunbridge Wells. Will either Mr. West or Mr. Spice favour the readers of the JOURNAL with his experience of it?

THE MANCHESTER CORPORATION SANITARY WORKS.—Last Friday the members of the Manchester Scientific and Mechanical Society, to the number of about 30, paid a visit to the sanitary works of the Manchester Corporation at Holt Town, where some 1600 tons of refuse closet matter are dealt with weekly. Mr. Whiley, the Superintendent, conducted the members over the works, and explained the various processes of dealing with every description of refuse material, and stated that 240 tons of manure, which was sold at £3 per ton, were manufactured weekly, the expenses in connection with the manufacture and sale amounting to about 30s. per ton. From the clinkers a large quantity of mortar was made, but the depression in the building trade had of late rendered this difficult of sale.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

SAFETY LAMPS IN GAS-WORKS.

SIR,—Owing to my being from home for a day or two, I was unable to reply in your last issue to the letter signed "W.," which appeared in the JOURNAL of the 13th inst. "W." says: "I shall be glad to know if an explosion has ever been caused by a Davy lamp when properly attended to."

Now, it seems to me "W." has the notion that gas managers have the option of arranging the circumstances when an explosion may be imminent, or, rather, that the Davy lamp, when surrounded by peril, can be so "properly attended to" as to prevent an explosion. Nothing of the sort.

Our Armstrong-made Davy lamps are good lamps, cleaned, trimmed, and examined carefully twice daily; yet it is my opinion that when the moment of peril arrives, the Davy lamp may be termed either a "Jamie" or "Mikey" lamp, so far as safety by its use is concerned. When 130,000 cubic feet of gas per hour are being manufactured, should the purifiers get so hard or clogged as to cause the back-pressure to rise suddenly during the hours of night, the men in charge at once turn off the foul purifier to prevent the lutes from blowing. But, while they are engaged cleaning the purifier so turned off, and getting light from four or six Davy lamps, the extra high pressure has caused the valve to loose its seal, and the gas gets into the empty purifier; a breeze of wind is blowing, an explosion occurs, the men inside on the sieves are landed outside right over the edge, and the sieves take fire; I get the cover on, and the valve watered up again, and all is once more quiet. I have seen from 50,000 to 80,000 cubic feet of gas escape thus. If a quiet night or morning, no explosion would occur, and I believe a lamp lowered into gas would go out. Not so, however, when a current of air strikes against the side of the lamp; then the flame lengthens, leans towards the lee side of the lamp, the wire-cloth gets red-hot, and the gas is ignited; unless by the force of wind the gas was driven through the gauze, when an explosion of the lamp would occur.

This occurred here while a purifier-cover was being lifted, and the men in charge of the lamp had not time to remove it before they were enveloped in pure flame, but without explosion, caused by the breeze blowing towards the lamp. They frequently go out in a dull, heavy atmosphere charged with gas, and it is my impression that when a lamp is surrounded by a dangerous atmosphere, to hurry the lamp (which shows signs of danger being at hand) too quickly away might thereby

only increase the risk of explosion, as it induces a current of air and gas to strike against the lamp, and thereby act as if a current or breeze of wind was doing the same thing; and in all probability the lamp would either explode or the gas would be ignited through reddening of the wire-cloth.

Narrow escapes have occurred by being able to remove the lamp in danger in time to prevent an explosion; but, as often as not, when a moment of danger occurs, it might not be possible to remove the lamp in time.

As a rule, I treat the Davy safety lamps quite as gingerly as "W." does; but I cannot agree with him as to the expression "eventually," used in his letter. "W." says: "The wire would become red hot, and eventually cause an explosion." The word "eventually" may mean instantaneously; but I think the word generally denotes "after a time," "by-and-by," or "after an effort," whereas the explosion may then occur as quick as thought. When Davy lamps are required on a breezy or windy dark night, and a large volume of gas is escaping, I have no hesitation in saying that the use of them is highly dangerous.

Davy lamps supplied by gas would be preferable to oil-lamps. The light could then be instantly extinguished, and thus an explosion or an ignition of gas would be prevented, which, if oil-lamps were used, it might be impossible to get away from in time to avoid an accident.

The lamp which caused one of the fires I alluded to in my former letter was carefully examined, and found to be in perfect order, and the only sign of the ignition was that the wire gauze was burnt red on one side.

Gas-Works, Tradeston, Glasgow, Jan. 20, 1880. WILLIAM KEY.

GAS-ENGINES.

SIR,—Owing to an oversight of mine, an error crept into my letter on "Gas-Engines," which you published last week. The fraction $\frac{1662}{14000}$ lb. correctly represents the quantity of coal per horse power per hour that the steam-engine would require, if all the heat of combustion were converted into power; but, by a mistake, this fraction is made equivalent to 0·081, or 1-12th of a pound, instead of 0·18, or a little over 1-6th.

The abbreviation H.P. was, in *Engineering* (from which you reprinted), misread "high pressure," instead of "horse power." I will therefore ask you to repeat the table of percentages of steam-engines, as the following is somewhat more correct than that previously given:—

Steam-engines using	2	lbs. of coal per	horse power	convert 9·0	per cent.
"	3	"	"	6·0	"
"	4	"	"	4·5	"
"	5	"	"	3·6	"
"	6	"	"	3·0	"
"	7	"	"	2·6	"
"	8	"	"	2·3	"
"	9	"	"	2·0	"
"	10	"	"	1·8	"

A correspondent has expressed his opinion that no gas-engine has worked with so low a consumption as 10 cubic feet. I have given only the manufacturers statements. Allowing even 20 feet consumption, which has certainly been proved, the gas-engine converts twice as much as the best steam-engine, and ten times as much as some small ones. If, as is frequently the case, the gas-engine is tested by the friction brake, and the steam-engine by the indicator, the former is unfairly over-weighted to the extent of 20 or 25 per cent.

Cork, Jan. 22, 1880. DENNY LANE.

Parliamentary Intelligence.

GAS AND WATER BILLS, 1880.

Up to Friday last, the final day for lodging memorials complaining of non-compliance with Standing Orders in the case of the remaining Bills on the list of petitions, no memorials had been received in relation to either the Hyde Gas Bill or the Sligo Borough Water Bill, the only two Bills having reference to gas or water; they will, therefore, go before the Examiners as unopposed.

The sittings of the Examiners commenced on Monday, the 19th inst., and continued during the week. Up to Saturday last the following unopposed petitions relating to Gas and Water Bills had been examined, and the Standing Orders declared to have been complied with:—

British Gaslight Company (Staffordshire Potteries) Bill; Burton-upon-Trent Corporation Bill; Cork Gas Bill; Cork Improvement Bill; Dagenham and District Sewage Bill; Denton and Haughton Gas Bill; Eastbourne Gas Bill; Exmouth and District Water Bill; Gaslight and Coke, Commercial, and South Metropolitan Gas Bill; Hinckley Local Board Bill; Huddersfield Improvement Bill; King's Lynn Corporation Bill; Lancaster Corporation Bill; Liverpool Corporation Water Bill; London Gaslight Company Bill; Oldham Improvement Bill; Portmadoc Water Bill; Prescot Gas Bill; Sea Water Supply to London Bill; Wrexham Water Bill; Yeadon and Guiseley Gas Bill.

In the cases of the Rathmines and Rathgar Township Water Bill, Rochester Corporation Bill, and Southwark and Vauxhall Water Bill (opposed petitions), the allegations of non-compliance with Standing Orders were not sustained.

The consideration of the petition for the Phœnix Gas Bill was adjourned until the 9th of February.

ODESSA GAS AND WATER SUPPLY.—Last Thursday's St. Petersburg *Golos* publishes intelligence from Odessa, stating that in consequence of the frequent discovery of excavations and fissures in a number of houses, causing damage to the gas and water pipes, it is believed that the city is undermined and threatened with serious danger. A Commission has consequently been formed to conduct investigations underneath the town.

THE LOWER THAMES VALLEY MAIN SEWERAGE BOARD.—The Local Government Board have remitted surcharges, amounting to £1672 1s. 7d., recently made on members of the above-named Board. The only surcharge upheld is a small item of £4 0s. 6d., for a luncheon for witnesses at an inquiry held by Colonel Cox, at Kingston. The action in the Rolls Court to make the Board liable for the expense, amounting to about £500, of going to Parliament for a Bill last session, is, however, still undecided.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

THURSDAY, JAN. 22.

(*Before Vice-Chancellor* MALINS.)

CORPORATION OF BOLTON *v.* BOARD OF GUARDIANS OF THE BOLTON POOR LAW UNION.

In this case the plaintiffs prayed a declaration that the scheme for the sewage and outfall works of the defendants for their No. 1 special drainage district, and the loan contracted by them in respect thereof, were *ultra vires* and illegal, and an injunction to restrain them from proceeding with the works.

Mr. HIGGINS, Q.C. (with him Mr. FREEMAN), who appeared for the plaintiffs, said the real question in the case was whether, the defendants having obtained the sanction of the Local Government Board to their scheme of drainage upon a mis-statement of an important fact, and having obtained a loan of £15,000 from the Public Works Loan Commissioners really by virtue of the same mis-statement, they were entitled to go on with the works, which the plaintiffs said were prejudicial to them, not only as ratepayers, but as the Urban Authority in the borough of Bolton. The mis-statement to which he referred was simply this: The Local Government Board, before consenting to any scheme, required an answer to be sent to certain questions, one of those questions being, whether any of the works in respect of which the application was made were to be constructed beyond the limits of the applicants sanitary district; and to that question the answer "No" was returned.

Mr. GLASSE, Q.C. (with him Mr. RUSSELL ROBERTS), who appeared for the defendants, said it was a pure mistake.

Mr. HIGGINS said the excuse for the mistake, as given by Mr. Cooper, the Clerk of the defendants, was this, that by misapprehension on the part of the Engineer who filled up the form, the reply "No" was inserted in the draft of the printed form, and was forwarded to the Local Government Board without the error having been noticed. Upon this mis-statement they had obtained a loan of £15,000.

Mr. GLASSE said the amount obtained on loan was only £5000.

Mr. HIGGINS said that another point to be considered was whether the defendants were to be allowed to go on with any part of their scheme, having regard to the fact that a necessary part of it was within the plaintiffs district, because it would be a mere waste of money to go on with the scheme in their own district if they could not do without the part in the plaintiffs district. The proper thing for the defendants to do was to connect their sewer with that of the plaintiffs.

The VICE-CHANCELLOR said he understood the case had stood over for some time in order that the parties might come to a settlement, but they had not been able to do so. He would now suggest that they should refer the whole matter to a third person, to say what ought to be done, as it was plain they both wanted to arrive at the same point.

Mr. HIGGINS said he wanted the defendants to keep out of his district. The plaintiffs system of sewerage had cost about £50,000; the sewer was large enough to carry off the sewage of both districts, and a connection between the two ought to be made, instead of the defendants being allowed to make a sewer running parallel with that of the plaintiffs for some 2000 yards.

The VICE-CHANCELLOR inquired whether it would not be for the common benefit of all that there should be one sewer instead of two.

Mr. HIGGINS thought it would. His clients were perfectly willing to give a guarantee that their sewer was large enough for both.

The VICE-CHANCELLOR asked whether the defendants had constructed their sewer.

Mr. HIGGINS said they had been prevented from doing so. He had a right to object to their coming within his district, except they complied with section 28 of the Public Health Act of 1875 (which provided for the mode of communicating with a sewer), or had the sanction of the Local Government Board for so doing.

Mr. GLASSE said the Local Government Board having the matter before them, his lordship had no power to interfere. After the mistake which had been referred to was discovered, his clients gave a new notice, and upon the expiration of the prescribed three months Colonel Ponsonby Cox had been sent down to inquire into the matter.

Mr. HIGGINS said the defendants did not discover the mistake until they were before Colonel Cox.

Mr. GLASSE said they discovered in February that they were going out of their district, and thereupon fresh notices, as required by the 32nd section of the Public Health Act, had been duly served upon all persons and bodies entitled to receive the same. An inquiry had been held, but the decision of the Government Inspector had not yet been communicated to the defendants, and until the necessary sanction had been obtained they did not intend to proceed with the execution of that part of the scheme which fell within the district of the plaintiffs.

The VICE-CHANCELLOR said if so, there was no occasion for an injunction.

Mr. HIGGINS said the defendants had advertised for tenders for the execution of the work.

Mr. GLASSE was willing to undertake not to go out of his district without first obtaining the consent of the Local Government Board.

Mr. HIGGINS could not be satisfied with the undertaking. As a ratepayer, he was entitled to stop the scheme altogether.

Mr. GLASSE said he could prove that the defendants system of drainage would be cheaper than the plaintiffs. They intended to proceed with the works within their own district, as they had a right to do, without obtaining any consent.

The VICE-CHANCELLOR inquired whether the £5000 lent by the Public Works Loan Commissioners would be expended by the defendants upon the works in their own district.

Mr. GLASSE said certainly, and they had the consent of the Board so to do.

Mr. HIGGINS thought it reasonable that this part should be left to the Local Government Board. It was the first time he had heard that the defendants had submitted themselves to the Local Government Board; but as it turned out to be so, his clients, as ratepayers, were willing to submit to the decision of the Board. Now that things had been discussed, he thought both sides might allow the motion to stand over generally, upon the understanding that the defendants would not attempt to proceed with the works in the plaintiffs district, without first giving ten days notice.

Mr. GLASSE did not see any harm in that, as he could not proceed without the sanction of the Local Government Board. Without prejudice to any question as to the propriety of the suit, and so forth, the motion could stand over upon the terms stated.

The VICE-CHANCELLOR said from what he had heard on both sides, it seemed to him to be pretty clear that inasmuch as the works were being constructed in a continuous district, it would be greatly to the advantage of both parties that only one sewer should be constructed, and he would strongly recommend the parties, if the two Engineers could not agree, to call in a third, to advise how one sewer might be made to drain both districts.

Mr. GLASSE said if it was possible of course it would be done.

Mr. Higgins thought the suggestion a very reasonable one.

The Vice-Chancellor said it seemed to him to be rather absurd to construct two parallel sewers.

The motion was ordered to stand over upon the terms stated, liberty being given to apply to advance the hearing in case the parties could not agree.

Miscellaneous News.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Third Annual Meeting of this Association was held at the Midland Hotel, Birmingham, on Thursday, the 15th inst. There were present—Messrs. P. Simpson (Rugby), President; C. Hunt (Birmingham), ex-President; J. Tindall (Walsall), Treasurer; W. North (Stourbridge), Honorary Secretary; and a good attendance of members.

The Honorary Secretary read the minutes of the last meeting, which were confirmed and signed. He also read the following report:—

In laying before you their second annual report, your Committee again desire to express their satisfaction at the progress made by the Association. The total number of members is now 37, being an increase of 4 during the year.

During the past year four ordinary meetings were held, with an average attendance of 20 members.

At the first meeting in the year, the President (Mr. Hunt) delivered an Inaugural Address, which has been printed and circulated among the members, after which a paper on "Meter-Rents" was read by Mr. Layton, of Redditch. The subject being such an important one, the paper was listened to with more than ordinary interest, and the discussion which followed was of a most interesting character.

At the second meeting the following subject was brought before the members:—"Public Lighting, with special reference to Streets, &c." An able and exhaustive paper on this subject was read by Mr. C. E. Jones, of Chesterfield, and a most interesting and profitable discussion followed.

At the third meeting an interesting and practical paper was read by Mr. Darwin, of Longton, on "The Manufacture of Gas from Coal Slack." The paper was thoroughly discussed by the members present, full particulars of which may be found in the quarterly reports.

At the last meeting, held in October, by the kind permission of the Gas Committee of the Corporation of Birmingham, their Windsor Street and Saltley works were thrown open for the inspection of the members, who fully appreciated their kindness. Afterwards, Mr. J. Annan, of Wolverhampton, introduced the subject of Condensation; and opinions on this most interesting subject were freely given by the members present. Mr. Peaty, of Longport, then gave a lucid description of "Hislop's Patent Process for Converting Spent Lime of Gas-Works into Quick Lime."

Your Committee consider the work of the Association during the year to have been fairly satisfactory. They would again appeal to the members for their practical sympathy, and hope to have offers of papers or of subjects for discussion.

The Treasurer read the statement of accounts, as under, for the year ending Dec. 31, 1879:—

Dr.				Cr.			
Balance brought forward . .	£4	19	10	Printing, stationery, postage, and reporting	£9	10	4
Subscriptions received during the year	17	6	6	Incidental expenses	0	2	6
					£9	12	10
				Balance in Treasurer's hands .	12	13	6
	£22	6	4		£22	6	4

Examined and found correct,
John Storer, William Cross, } Auditors.

Mr. C. E. Jones (Chesterfield): The statement of accounts is very satisfactory, but I should like to see an increase in our numbers, and I hope every member present will try and bring a new member, or candidate for membership, before the next meeting. The fact of having £12 13s. 6d. in hand points to great economy in administration, and it is a matter for much congratulation. I hope we shall not suffer any reverse with regard to our financial position, but go on prospering, and prosper likewise with regard to the number of members on our list. I beg to move—"That the report and statement of accounts as read be adopted, and entered on the minutes."

Mr. R. Morland (Gloucester) seconded the motion, which was put and carried.

New Members.

The Honorary Secretary read the following minute from the Committee meeting:—"That Mr. H. S. Pike (Hinckley), and Mr. J. E. Palmer (Malvern), be elected members of the Association;" and on the motion of Mr. Tindall, seconded by Mr. Hunt, the minute was adopted.

The President then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—Although I highly appreciate the honour which you have conferred upon me in placing me in this chair, I feel the duty of addressing you to-day (if it be a duty) is one which usage alone has created, and whether it would be "more honoured in the breach than in the observance" on the present occasion has troubled me not a little; but rather than shrink from any work which might be regarded as belonging to the honourable position to which you have elected me, I have ventured upon a task, my fitness for which I very much question. I am, however, much cheered and encouraged by the kindly feeling which pervades this Association at all our meetings. They have seemed to me to partake more of the character of family gatherings, where we have met to discuss the common good, and to advance the individual interests of each member of that family; and it is my earnest wish that such kindly feeling may long continue to be a marked feature of the Midland Association of Gas Managers. By cultivating such feelings we shall add much to the pleasure of our meetings, and also contribute largely to the knowledge of each of its members.

I take upon myself to say that, as an Association, we have done a fair share of useful work. Our papers and discussions have been of a practical and instructing character, and have done much to give information on the subjects under notice; and I cannot allow this opportunity to pass without again thanking our Past-President, Mr. Charles Hunt, for the great pleasure he provided for us all in arranging for such a complete examination into all the details of the electric light as most of us had the privilege of making at the Curzon Hall in this town. That examination, I believe, convinced most of us that there was yet a great deal to be done before the electric light wholly superseded gas light, and we are still of the same opinion. But let me say what I believe to be true—that gas managers are not the men to say that it will never be, but would rather rejoice to see the hard-working, anxious searcher after the missing link rewarded with success. It seems to take a long time to adapt this light to the wants of the public. I was rather surprised, on looking over my old copies of the Journal of Gas Lighting the other day, to find that in the very first number of that Journal, published in February, 1849, a Mr. Staite had exhibited the electric light from the portico of the National Gallery, and was then forming a Company to bring the light into general use; and so it has gone on making slow progress up to now. There might be a great deal said about the different patents in use for producing the electric light, but as I must plead great ignorance on the subject, and am afraid I must be one of those who, when the light is brought into general use, will have to retire into private life without a pension to cheer their declining days.

With gas it has been somewhat different. In 1792, Mr. Murdoch first used gas in his own house and offices; in 1797 that gentleman lighted Boulton and Watt's manufactory at Soho, near this town; and so it went on—every year some large factory or building was lighted up, till, in 1807, part of London was lighted with gas-lamps, and from 1810 to 1820 Parliament was literally deluged with Bills for lighting the large towns in this country. And so it has progressed till now, when there are in existence over 1700 companies formed for the purpose of supplying gas; and if we add to that number the private works for the lighting of mansions and factories, we may fairly say that there are over 2500 gas-works in Great Britain and Ireland.

Now let us for a little while consider the duty of those who have the oversight of the great amount of capital that is expended in gas lighting, in relation to their employers and to the public. And first as to their employers. In my opinion, success in the management of gas-works depends very much on the amount of attention that is paid to details; and the younger members of this Association will pardon me if I impress that fact on their notice. Much depends on the regularity and punctuality with which every duty is attended to, and the most trifling thing, if neglected, may be the forerunner of some serious inconvenience, or perhaps some disaster that will disturb the whole works. I believe I am correct in stating that although gas-works are more liable than most other manufactories to break down and become disarranged, yet we rarely hear of a town being in darkness through such misfortune; and this, in my opinion, says very much for the men chosen to manage these undertakings.

To go through the improvements made in the different apparatus used in the manufacture of gas would take up too much of your time. I should like to call your attention to the setting of retorts, and to any appliances that will improve those settings and reduce the fuel account. A great deal of our profits must come from economy in the retort-house. Let us see, therefore, that all the coal taken over the machine finds its way into the retorts. Then, again, our products become more valuable, and it is our place to see that the most is made of them, and that we send nothing out of the gas-works which should be kept at home; in fact, to use our best endeavours to cheapen the production of gas, so that the consumers may have it delivered to them in a condition fit for use, and as cheap as possible consistent with a fair return for the money expended in construction. Although much has been done in this direction, we have by no means reached the end of the chapter; so we must go on doing our utmost to reduce the cost, in order to increase the consumption, and be the better able to meet any rival that may try to take our place. This part of my subject may be summed up in a few words: Let us see that we gather up the fragments, so that nothing be lost.

Now a few words on our duty to the public. They have a right to be supplied with a good article, and in return for the monopoly that it is necessary for us to possess, we have not only a right, but it is to our interest that it should be as cheap as possible, taking into consideration the different circumstances under which we may be placed. I am aware it is difficult to convince the public that there are any circumstances in the case; but it is our duty to show them clearly and plainly that there are circumstances which must be considered in fixing the selling price of gas in different towns. I believe it is a fact beyond dispute that those gas companies who have taken the most trouble in educating their customers in the best modes of consuming the gas, either as to lighting, heating, cooking, or using it as a motive power, have been the most successful in keeping their customers satisfied, and in increasing their consumption. I am of opinion that we are only in our infancy as to the application of gas for heating and cooking purposes, and as a motive power. At first we were content to have engines of 1, 2, or 3-horse power driven by gas; but now we go in for 16-horse power, and I have no doubt that we shall have still larger ones.

I should like to say a few words on our relations to the parent Association, the more so as I believe that my early connection with that Association weighed somewhat with you in conferring upon me the honour of occupying this chair. The British Association of Gas Managers has grown far beyond the most sanguine expectations of its friends, and we all hope that it will still continue to grow until the name of every qualified person is placed on its roll. I feel quite certain that the Association would have been established and carried on by the combined energies of the men who started it, yet we are much indebted to Messrs. Thomas Hawksley, T. G. Barlow, E. Goddard, and W. Esson, the first four Presidents of that Association, and to the indefatigable Secretary, Mr. James Blackburn, for its rapid growth and the strength which it acquired in such a short time. It has grown much since then, under the able successors of those gentlemen, until it now numbers nearly 700 members; and to me it appears that the numbers on the roll have to some extent altered its position. It must now take a higher platform than heretofore; it must now be the place where all the leading subjects under discussion must come up for settlement. Hence, in my opinion, the great need for such branch associations as this, where we can calmly and carefully consider the details of our manufactures, where every one can have an opportunity of expressing his opinion freely among his brethren of the district, which will greatly help him, and give him courage—and, let me say, it requires a great deal of that—to stand up and explain his views in the presence of the great numbers assembled at the annual meeting of the parent Association. I quite agree with the views expressed by the last President, Mr. W. J. Warner, at Newcastle, with reference to the annual meeting of the British Association, which, in his opinion, should be occupied in the discussion of some leading subject of interest, or that some new invention should be exhibited and explained, or statistical information gathered from the different localities where branch associations had been formed; and if, after due consideration, such work is thought not to be the best for the parent Association, it will still be our place, as a branch association, to supply at least one paper for the annual meeting of the parent Association, and in this way relieve the Committee of a great deal of labour.

There is one part of Mr. Warner's address at Newcastle to which I have not yet given my approval, and I think it would be well for district associations to consider the subject—namely, the classification of our members. It might not affect the parent Association, but I am of opinion that such classification would have a tendency to disturb that free and brotherly feeling that is such a marked feature in our Association. While I am free to acknowledge that the hard and careful worker should be honoured and have his reward, I feel assured that his energies will bring him to the front; but I am rather in doubt whether would be most appreciated by such members the honour, which merely consists in the fact that their efforts are recognized and have the full approbation of the rest of the members, or some more substantial honour, as would be the case if examiners were appointed to carefully weigh and consider the respective merits of such members. This subject is worthy of our careful consideration, and I should like it to be the subject for one of our meetings during the year.

I might have taken up more of the time of the meeting by giving my opinion on the various improvements connected with gas manufacture

introduced during the last year, and as to what we might be looking forward to for this year; but I would rather that such subjects should be brought before the Association when they can be discussed by the members.

I have only further to thank you for the kind manner with which you have listened to me, and to apologize for the crude remarks I have made. By your aid, and with what little energy I can put into the Association for this year, I hope at the end of it we shall be nothing worse, but stand in a better position. We ought to grow in numbers, and I hope this will be the case during my presidency.

Mr. C. Hunt said they had all listened with pleasure to a most excellent address, and he moved that the very cordial thanks of the meeting be given to the President for it.

Mr. Jones seconded the motion. He said that the address was fraught with practical knowledge. It did not deal with the abstruse problem of electricity, nor with such questions as were probably more interesting to the metaphysician than to gas managers; but it did deal with such questions and such matters as every gas manager, whatever might be the extent of his responsibility, must undoubtedly take to himself. Personally, he thanked Mr. Simpson for calling his (Mr. Jones's) attention to the necessity of dealing with details. It was of the utmost importance, to his mind, that all persons in charge of gas-works should attend to detail, and unless proper attention was bestowed upon the details of the establishment, nothing like successful management could result. There was only one point to which he took exception in the address. Mr. Storer said the Midland Association was a branch of the parent Association. He (Mr. Jones) maintained that the shortcomings of the parent Association necessitated the formation of minor associations or district associations in various parts of the kingdom. He was not for a moment endeavouring to disparage or depreciate the value of the parent Association; he should like to see every gas manager a member of the Association, believing that "unity is strength," and that if a man had any pretensions whatever to call himself the manager of gas-works, he had no right to withhold his public support to the business he called his own, but that he ought to join the parent Association. The parent Association, however, had not supplied a free and easy means of intercourse and for the interchange of opinion, which was so desirable among gas managers who wished to unravel the mysteries of their profession; and therefore it was district associations had sprung into existence with more or less success, and supplied the want before alluded to. That such an association as the Midland Association of Gas Managers was requisite, and indeed was imperatively demanded in the district, was, he thought, evidenced by the fact that, though this was but the third annual meeting, they had, comparatively speaking, maintained their position, both with regard to the scientific bearing and value of the discussions, and also with regard to numbers. He did not consider the Association was at all indebted to the British Association of Gas Managers for its formation, but to the public spirit of the members, and the necessary intercourse which all felt to be requisite in order to exchange views upon an ever-varying industry. He most heartily and thoroughly endorsed every word that the ex-President had said with regard to the President's address.

Mr. Hunt said it was not customary for them to discuss the matter of the President's address, and he trusted it never would be. Mr. Jones had, however, referred to one point in it, and it seemed to him (Mr. Hunt) desirable that this reference should not pass without observation. Mr. Jones appeared to attribute the formation of district associations to shortcomings on the part of the British Association, whereas it seemed to him Mr. Hunt) that it was the very success of the latter which rendered the formation of the former not only desirable, but almost necessary. The large annual gatherings of the parent Association necessitated the observance of strict formalities in the conduct of the meetings, rendering them less adapted for what he might term elementary work; whereas at the gatherings of district associations the members met in a semi-private manner, and were able to discuss matters fully and freely amongst themselves. In this way the district associations performed most useful work, preparatory, as it were, to the advanced school in which they were all more or less ambitious to shine.

The motion was then agreed to.

The President, in acknowledging the vote, said it was perhaps right that he should defend himself with reference to what Mr. Jones had said regarding the parent Association. What he meant was, that the parent Association, by its numbers, was stopped in its usefulness, and he tried to express that the district associations nearer home were just the things that were wanted, where one could express an opinion freely; but he thought the day was distant when they would say they had no connection with the parent Association. If that was what Mr. Jones meant to infer from what he (the President) had said, he misunderstood him, as he referred to the parent Association taking a higher platform, where the district associations could bring their quota to make it worthy of the British Association.

Mr. Jones explained that what he meant was that the parent Association never did supply to its members the same facility as was supplied by the district associations; and hence the necessity sprang up for the district associations. That they had so sprung up and been so useful was, he considered, a matter for great congratulation. As he said before, he did not wish to disparage the parent Association in any shape or form, but he certainly believed in the district associations as being calculated to confer considerable benefit on all gas managers who joined them.

Mr. Annan (Wolverhampton) said it would be quite impossible for the parent Association to carry out what Mr. Jones required, seeing it only met once a year. It, therefore, could not do what the district Associations did, meeting oftener. If he modified his statement, it might be sent forth, but it would never do to send it forth unexplained.

The President said he had belonged to the parent Association since its formation, and it was only when the number of members was smaller that they were able to go into the details of an argument as at their (the Midland Association's) discussions. When the number of members was less, he enjoyed it as much as ever he enjoyed the district meetings; but it was quite impossible to have quarterly meetings when the members had such long distances to travel.

[A paper on "A New Form of Washer," was then read by Mr. W. North, of Stourbridge. This, and the report of the subsequent proceedings at the meeting, we reserve till next issue.—Ed. J. G. L.]

Ongar Gas Company, Limited.—This Company, which was registered on the 17th inst., with a capital of £3000 in £5 shares, proposes to purchase the private gas-works and apparatus at Ongar, Essex, now used for lighting the place.

Extension of the Leeds Corporation Gas-Works.—Last Saturday's *Leeds Mercury* states that, at a meeting of the Gas Committee of the Leeds Corporation, held the previous day, it was resolved to proceed with an extension of the gas-works at New Wortley, for which there is vacant ground available; and Mr. Henry Woodall, the Gas Engineer, was instructed to prepare plans with that view.

THE PUBLIC LIGHTING OF DUBLIN.

An Adjourned Meeting of the Corporation of Dublin was held on Monday, the 19th inst.—the Lord Mayor (Mr. E. D. Gray, M.P.) presiding—when,

The Town Clerk said that he had received a further letter from Mr. W. F. Cotton, Secretary and Manager of the Gas Company, as to the terms on which gas could be supplied for the public lamps. The Committee on Public Lighting had nothing to propose in reference to the letter, and so had merely asked him to read it. It was as follows:—

Dear Sir,—I beg to acknowledge the receipt of your letter of the 3rd inst., in which you state "that the Committee infer that, though the Company state they cannot reduce the price, the charge proposed in the letter referred to for the gas supplied is the ordinary price charged for gas within the city." In reply, I am directed to state that it was by arrangement with the Corporation, made over three years since, that the gas supplied to the public lamps was charged at the ordinary price to consumers—a system similar to that in London and elsewhere.

Referring to the question of discount, the Committee have evidently overlooked the fact stated in my letter of the 24th ult. [*see ante*, p. 18]—viz., that the Company have invested a large amount of capital in the public lighting plant, and have given the Corporation the use of same, free of charge, whereas in London and other large towns the plant has been supplied at the expense of the Local Authorities. The interest upon the capital invested by this Company in said plant, added to a portion of the cost of repairs, painting, &c., with meter-rent, is equal to a discount of about 40 per cent. on the gas consumed in the public lamps. Although present circumstances will not admit of any change in the price of gas, my Directors will take the first opportunity for making a general reduction, in which the Corporation will participate. They have embraced every occasion for doing so, notwithstanding that they were not bound by agreement, in evidence of which I may mention that had they adhered to the terms of the arrangement made with the Corporation three years since, the price of gas for public and private consumption within the city could have been maintained at 4s. 6d. per 1000 cubic feet, instead of which they reduced the price to 4s. 3d. from January, 1879.

Your letter implies that in mine of the 24th of December my Directors proposed arbitration. Such, you will find, is not the case; but having submitted terms which they considered most reasonable, and the Committee being of the contrary opinion, the course open to the Corporation for ascertaining whether the terms were excessive or otherwise was simply pointed out.

Referring to the last paragraph in your letter also, you notice, under the 34 & 35 Vict., c. 41, if the Committee deem fit to vary the terms of my letter of the 1st inst., my Directors will offer no objection; but it is to be distinctly understood that for any term less than one year the charges will be as follows:—For gas, 4s. 3d. per 1000 cubic feet; meter-rent at the rate of 3s. per meter per annum; repairs, painting, &c., at the rate of 9s. per lamp per annum; rent for the use of lamp-columns, lamps, and other public lighting plant, 10s. 6d. per lamp per annum.

(Signed) W. F. Cotton.

Alderman Harris said the Council ordered the Committee to request the Gas Company to continue the lighting of the city for three months. They did so, and the Council had now before them the reply of the Company. The Committee were not prepared to offer any suggestion in the matter.

Mr. Mayne said that matters looked much worse on this question now than when the Committee commenced their negotiations; and, but for the electric light scare, there would be only one course open to the Council—namely, to go to Parliament and obtain power to make gas for the citizens, within the municipal boundaries at all events. The Gas Committee had gone carefully into this matter. They had found that the Corporation of Belfast were supplying gas to their Municipality at 2s. 9½d. per 1000 cubic feet, and were putting by a large profit. They had accumulated a surplus since 1874, which amounted to between £70,000 and £80,000. They were doing this although they had had to pay every farthing that had been invested in gas plant in Belfast since 1823; they had paid in round numbers £196,000. If the Dublin Corporation were to obtain parliamentary powers for the manufacture of gas, they could supply it for 2s. 6d. per 1000 feet, giving as good a quality of gas as was at present supplied. He thought they would be fully justified in trying to save the citizens the difference between this amount and 4s. 3d. per 1000 feet. The question would come before the Council much sooner than the Gas Company thought. In the paper of business there was a communication from electrical engineers in London, who, of course, made the best case they could; but what they alleged was that for the illumination of large spaces the electric light was much better and more economical than gas. The question would come before the Council in a few weeks, for one of the largest spaces they had to light was Sackville Street. A few experimental lamps had been put up by the Gas Company in Lower Sackville Street; and, up to the present time, the Company had not charged for the extra gas that was consumed in these; but they had now called on the Paving and Lighting Committee to decide whether they would retain these lamps or not, as they (the Company) were anxious to remove them, and return to the burners that were there before. The Committee asked for particulars, and found that each of the new lamps consumed four times as much gas as one of those constructed on the old principle. The cost of the large lamp in the centre of the street, next Carlisle Bridge, was 4d. per hour, or £57 15s. 10d. per year. Before the alteration in the lamps, there were 83 lamps in Sackville Street, the cost of lighting which was about £290 a year. That multiplied by four would bring the cost of lighting the street with the new lamps above £1000 a year. They could hardly afford to spend so much on a single street. The difficulty, however, the Committee were in, was that the citizens liked the improved lighting.

Mr. M'Evoy moved that the letter should be inserted on the minutes, and the Committee requested to report at once respecting the question of reference to arbitration under the Gas-Works Clauses Act, 1871.

Mr. J. P. Byrne seconded the motion.

Alderman Harris said the arbitration clauses of the Act were very dangerous, and he did not like reference to arbitration. He would like to know where such a course would be likely to land them, and suggested that a contract should be entered into for twelve months, and in the meantime the gas question should be referred to a Committee.

Alderman Gregg said he had been induced to obtain a report of the Belfast Corporation Gas-Works, and he did not think it was any use instituting a comparison between the Gas Company in Dublin, who were working upon commercial principles, and in existence avowedly for making a profit, and the Belfast Corporation, who had borrowed their money at 4 per cent., while the Shareholders of the Gas Company received 10 per cent., or a difference between the two of 6 per cent., or 8d. per 1000 feet of gas sold. He had been, in the days of the old Gas Company, in favour of buying their works; but he was afraid that the present Company's works would not be offered on the same terms. He might state that the Belfast Corporation carbonized 50,000 tons of coal annually, and the Dublin Gas Company 109,000 tons. Taking the capital of the Company at £737,000, and taking the capital of the Corporation at £500,000, they found the capital of the Company 50 per cent. in excess of the capital of the Corporation. Each million cubic feet of gas, however, cost the Belfast Corporation £1030; and in Dublin, although the capital was much higher, it only cost £815. This showed that there was either a great amount of economy, a much better method of carbonization, or less leakage. He did not think, therefore, it was a business or common-sense way to approach the Gas Company as if they were a set of schemers. The Dublin lamps cost £3 8s. each for lighting, cleaning, and everything else. The price paid by the Corporation of London, and other Corporations, was from £3 19s. to £4 7s. apiece; and, in addition, the Local Authorities had to pay for plant and everything else. If the Dublin Corporation went to

arbitration, they would find they would have to pay for every single thing connected with public lighting, which they did not do now.

Mr. MAYNE said the paid-up capital at Belfast was £200,000, and the old Company borrowed £50,000 at the time of purchase. They were working the whole gas business of Belfast upon an area of 7000 acres, while the municipal area of Dublin was only 4000 acres. On a capital of £250,000, the Corporation had to pay, in order to get the works, £196,000 for goodwill. They borrowed all this money—£450,000—and Alderman Gregg said they were only paying 4 per cent., but they were paying 6 per cent., paying off the capital and interest together, and in a certain number of years the people of Belfast would have gas at less than half the present prices. Alderman Gregg's figures proved his (Mr. Mayne's) case, that the Corporation were bound to step in and save the citizens.

The resolution was passed.

THE BRITISH GAS COMPANY AND THEIR POTTERIES STATION.

A Meeting of the Hanley Town Council was held last Tuesday—the MAYOR (Mr. J. Bromley) in the chair—when the General Purposes Committee reported that they had received a letter from Mr. F. L. Linging, the Secretary of the British Gaslight Company, Limited, stating that the Directors had no intention to part with their gas-works at Etruria. Also that the Town Clerk had submitted to them a Bill to be brought before the ensuing session of Parliament by the Company for empowering them to enlarge their works and to expend further capital to the amount of £75,000. The Committee stated they were of opinion that the Bill would prejudicially affect the interests of the ratepayers of the borough, and they recommended that immediate steps be taken to oppose the Bill in its present form.

Alderman GILMAN moved the adoption of the report.

Alderman RIDGWAY said that, in order to enable the Committee to oppose the Company's Bill, it would be necessary that a special meeting of the Council should be called. The Company sought to extend their capital to a considerable amount, and at a high rate of interest, without giving security for the public audit of their accounts. There was no guarantee that there would be any diminution of the present charge for gas; but perhaps, by negotiations, better terms than those contained in the Bill to be submitted to Parliament might be obtained, failing which they would have no alternative but to oppose the Bill. He seconded the motion for the adoption of the report, with the addition that a special meeting of the Council be convened for the purpose of passing a resolution for opposing the Bill.

Mr. HAMMERSLEY directed attention to the provisions of the proposed Bill. The Company, he said, wished to raise capital, and pay a dividend of 7 per cent., while the Bill contained none of the redeeming features of recent legislation on the subject—the auditing of the accounts by the Corporation, the reduction of the price of gas on a sliding scale, and the sale of shares by auction. He contrasted the accounts of the Company with those relating to the gas-works at Stoke and Fenton, and argued that if the Hanley Corporation obtained the works on the same terms as those for which the Stoke and Fenton works had been obtained, the profits would enable the Council to save 1s. in the pound on the borough-rate.

Mr. BEBBINGTON moved, as an amendment—"That the General Purposes Committee be requested to open negotiations with the Gas Company with a view to prevent going to Parliament to oppose the Bill," and gave his reasons for doing so, which were mainly that the past experience of the ratepayers going to Parliament on the gas question was such as would not make it advisable to again take such a step, if by other means the Corporation could obtain the protection they would seek.

Alderman POWELL seconded the amendment, and said he should not be satisfied until the Corporation had the gas-works in their own hands. He felt sure they would have them, and that possession of them was only a question of time.

The CHAIRMAN said the letter the Company had sent stated that they had no intention to sell.

Alderman CARTLEDGE said the main question which the Corporation would have to fight in reference to the Bill was the rate of interest to be allowed on the borrowed money. They should direct their efforts to prevent the Company paying more than 4 per cent. on the money proposed to be borrowed.

Two resolutions were afterwards submitted to the meeting and carried—the first being that a special meeting of the Council be convened to consider the Bill, and the second that the Committee be requested to enter into negotiations with the Company with a view of securing the desired alterations of the Bill without the necessity of going to Parliament to oppose. The report of the Committee was also formally adopted.

THE GAS SUPPLY OF STONE.

Among the notices of applications for Provisional Orders, which appeared in the JOURNAL for the 2nd ult., was one by the Stone Local Board, who intend applying to, and have lodged with the Local Government Board for approval and confirmation, an Order to empower them to construct gas-works within the district of the Board and the townships of Stone and Meaford, and to manufacture and supply gas within this district and the townships of Aston, Darlaston, Meaford, Oulton, and Walton.

At the meeting of the Local Board on Monday of last week—Dr. E. FERNIE in the chair—a letter was read from the Local Government Board, stating that a memorial had been received from the Stone Gaslight and Coke Company with reference to the application. A copy of the memorial was enclosed, and the Central Authority requested to be furnished with any observations the Local Board might make in regard to it. Among the grounds urged by the Gas Company against the granting of the Order were (1) that the town and villages surrounding are amply supplied with gas of more than the average quality, and no complaints whatever are made; (2) that when the Company bought the old works the price of gas was 7s. 6d. and 6s. 8d. per 1000 feet, but it now stands at 4s. 2d. net, with the exception of the brewery and town lights, which are charged 3s. 9d. per 1000 feet; (3) that when coals were dear, during the years 1872 to 1876, the Company did not raise the price of gas, but charged the usual price, which was not done in other towns; (4) that the present works are capable of making gas for double the present population of Stone, the make for the last year having been about 12 million feet; (5) that the Road Surveyor (prior to the foundation of the Local Board) never made any complaint against the Company for breaking the roads; and it was further submitted that the sewage scheme should be carried out before the Local Board interfered as to gas-works, and even then the rates would be so heavy that numbers within the district would be unable to pay them.

In support of the objections, copies of letters were sent from Mr. J. M. Darwin, of the Corporation Gas-Works, Longton, and Mr. John Storer, of the Stafford Corporation Gas-Works, stating that after going through the accounts of the Gas Company they had made the following valuations of the plant and works:—Mr. Darwin, upwards of £20,000; Mr. Storer, from £20,000 to £25,000. Certificates had also been received by the Local Government Board from certain residents of the town and immediate neighbourhood, stating that the quality, quantity, and efficiency of the supply of gas by the existing Company were in every way satisfactory; also that additional gas-works were unnecessary and uncalled for.

After considerable discussion in committee, it was agreed to instruct the Clerk to reply to the letter from the Local Government Board that they consider (1) that the Stone Gas-Works are badly situated, being close to the principal street of the town, and the gasholders placed within 50 yards of a large population; (2) that the works have hitherto been unskilfully managed, an explosion having occurred in July of the last year which alarmed and endangered the lives of all residing in the neighbourhood; (3) that in spite of repeated complaints from the inhabitants, and from the Local Board, the Company continue the use of lime as a purifier, instead of oxide of iron, thus creating an intolerable nuisance, which has seriously deteriorated the value of property in the vicinity of the works; (4) that the price charged for gas is exorbitant, considering the profits that have been derived from the works, as proved by the fact that on the incorporation of the Company in 1877, with a capital paid up of £9000, divided into 1800 £5 shares, 600 only of the shares had been subscribed for, the remaining 1200 having been manufactured out of the profits, and distributed *pro raté* as a free gift to the Shareholders. He was further instructed to state that the Company have, ever since their formation, paid a dividend of 5 per cent., and for many years past 10 per cent. The half-yearly balance-sheet published in March, 1879, showed that, in addition to paying a dividend at the rate of 5s. per cent. on the trebled capital, the earnings would have justified a division of more than double that amount, which surplus, instead of being utilized by the Directors to reduce the price of gas, was put on one side to pay for the cost of further improvements and extensions. The Local Board having only recently obtained this information, and having been already told by the Directors that they could not afford to lower the price of gas to private consumers, proposed to purchase the undertaking, which, it was then discovered, had no statutory powers attached to it. This proposal had elicited from the Secretary of the Company the reply that the Directors would advise their Shareholders to sell the works for £20,000, but he was instructed to add that it would be of no use for the Local Board to offer a less amount, thus effectually barring the way to any valuation and purchase by arbitration. The Local Board then submitted the following resolution to the Gas Company as a way out of the difficulty, since the price would then be fixed by Act of Parliament, and the Local Board would be able to obtain the necessary powers of control as to the quality, quantity, illuminating power, and pressure of the gas supplied to them:—"That negotiations be suspended until the Gas Company have obtained either an Act of Parliament or a Provisional Order to legalize their undertaking, when the Local Board will be willing to purchase the works by valuation; but, that there may be no further delay, the Clerk be instructed, in case of a refusal, to serve, before the 1st of November, upon the Company, the notice required of the Board's intention themselves to apply for a Provisional Order, but to explain that an application for a Provisional Order by the Gas Company will be accepted as satisfactory." The Gas Company took no notice of this request, though ample time was allowed them, hence the present application by the Local Board, as the only way to relieve the ratepayers of the overcharge in the price of gas. The Local Board were aware that the district could not sustain two gas undertakings, but they ventured to think that the undertaking which had statutory powers would be the only successful one. Extraneous matters introduced as objections by the Gas Company did not appear to the Local Board to require any answer from them.

SALE OF SHARES IN THE GRAND JUNCTION WATER-WORKS COMPANY.

On Thursday last, Messrs. Edwin Fox and Bousfield offered for sale at the Cannon Street Hotel 1000 £50 shares in the Grand Junction Water-Works Company, being the first portion of the additional capital of £300,000 authorized to be raised by the Company's Act of 1878. The shares are entitled to a dividend not exceeding 7 per cent. per annum, and were submitted to public competition under the auction clauses in the above-named Act.

In opening the sale, Mr. BOUSFIELD briefly referred to the financial position of the Company, the capital of which, he said, amounted to £1,248,465, the income from water-rents last year having been £135,289. The Company's available profits applicable for payment of dividend and interest had increased year by year for many years. In 1871, the profits were £59,202; in 1878, they amounted to £83,353. The dividend paid on the ordinary share capital of the Company was in each half year of 1878 at the rate of 7 per cent. per annum; in the first half year of 1879 at the same rate, and in the second half of the year at the rate of 7½ per cent. The debenture debt of the Company was small, there was no preference stock, and all the works were in good order. There was great scope for increase in revenue, as the district over which the Company had the monopoly was now being opened up by additional railway communication with all parts of London. In his opinion, therefore, the shares offered one of the best investments in the market. The dividend would accrue as from the day of sale, and though the shares were not entitled to a higher dividend than 7 per cent., yet by the increased interest on other shares they partook practically of a preferential character. A reserve price had been placed on the several lots, but it was a purely nominal sum, and the highest bidder would become the purchaser. The shares were offered singly, and in lots of two, three, and four, and buyers of any lot had the option of taking any or all of the next four lots at the same price per share.

The biddings then commenced, and the following prices were realized:

2	shares at £91	each	£182	0	0
138	" " 90	"	12,420	0	0
22	" " 89	"	1,958	0	0
28	" " 88	"	2,464	0	0
66	" " 87	"	5,742	0	0
10	" " 86½	"	865	0	0
38	" " 86	"	3,268	0	0
11	" " 85½	"	940	10	0
39	" " 85	"	3,315	0	0
3	" " 84½	"	253	10	0
21	" " 84	"	1,764	0	0
22	" " 83½	"	1,887	0	0
4	" " 83¼	"	333	0	0
27	" " 83	"	2,241	0	0
20	" " 82¾	"	1,655	0	0
35	" " 82½	"	2,887	10	0
36	" " 82¼	"	2,961	0	0
27	" " 82	"	2,214	0	0
53	" " 81½	"	4,319	10	0
39	" " 81	"	3,159	0	0
44	" " 80¾	"	3,553	0	0
135	" " 80½	"	10,867	10	0
180	" " 80	"	14,400	0	0
1000 shares		Total amount realized.	£83,599	10	0

METROPOLIS WATER SUPPLY.

Lieut.-Col. Bolton, in his report to the Local Government Board, on the water supplied by the Metropolitan Water Companies during last month, says: "The state of the water in the Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) was good throughout the month, except on the 30th and 31st of December, when it was very turbid and bad. The highest flood state of the river at West Molesey during the month was 1 ft. 8 in. above summer level, and the lowest the summer level, the rainfall being 0·54 inch. The water in the River Lea was generally good during the month. [These remarks refer to the condition of the water previous to filtration.] The water at all the intakes was generally in a good condition during the month of December, and the filtration was efficient, the water supplied by the whole of the Metropolitan Water Companies having been clear, bright, and properly filtered."

THE LIVERPOOL CORPORATION (VYRNWY) WATER SCHEME.

Town Council Meeting to Approve the Bill.

A Special Meeting of the Liverpool Town Council was held last Wednesday—the Mayor (Alderman Hall) in the chair—for the purpose of confirming the propriety of promoting the Bill in Parliament, of which notice has been given, for carrying out the Vyrnwy water scheme. The meeting was held in compliance with the Borough Funds Act, which requires that the resolution voting the necessary expenses out of the funds or rates in the hands of the Council should be carried by an absolute majority (33) of the whole number of the Council.

A communication from the Liverpool Land and Householders Association was read, urging the Council to postpone the promotion of the Bill.

Mr. Wilson, Chairman of the Water Committee, formally moved the following resolution:—"To consider and, if thought expedient, to confirm the propriety of promoting a local Bill in Parliament, intituled 'A Bill for enabling the Mayor, Aldermen, and Burgesses of the borough of Liverpool, in the county of Lancaster, to obtain a supply of water from the Rivers Vyrnwy, Marchnant, and Afon Cowny, in Montgomeryshire, and for other purposes;' and to authorize and empower the Water Committee of the said Council to take such proceedings and incur such costs and expenses of and in relation to the promotion of the said Bill as shall be necessary, and to determine and direct that the same shall be defrayed out of the funds or rates in the hands of the Council, or hereafter to accrue to them on the Liverpool water account."

Alderman Rigby seconded the motion.

Alderman Samuelson asked what amount had so far been expended in promoting the Vyrnwy scheme. He said he made the inquiry because he understood the financial question was likely to be raised; and as very large figures would no doubt be named, they ought to know what amount had been expended before they came to a determination.

Alderman Forwood asked if the Chairman would explain the following clause in the Bill:—"And whereas estimates have been prepared by the Corporation for the purchase of lands for, and for the execution of the said works, and the same amount to the sum of £3,250,000," &c.; and whether that sum was not largely in excess of the sum stated in the estimates brought before the Council.

Mr. Wilson said the money already expended on the scheme, including the cost of surveys and experiments to ascertain the foundation of the embankments of the Vyrnwy, amounted to £15,000 or £16,000. This included also £1200 for the poll under the Borough Funds Act. With reference to Mr. Forwood's question as to the difference between the estimate which they now asked the Council for, and the sum originally mentioned—namely, £1,250,000—it arose in this way. The Vyrnwy scheme was estimated to produce about 40 million gallons of water per diem. This was being divided into three sections, and the cost of the first of those sections, including filtration, was estimated at £1,250,000 sterling. When the Town Clerk went up to London, he was apprised by the Parliamentary Agents that, in the interests of Liverpool, it was most desirable that the Corporation should take powers to execute the whole scheme when the occasion arose, and that the difficulties of the contest would be quite as great with the first section as they would be with the whole. Therefore it was thought better that the Corporation, when the time came, should avoid the cost of two contests. It might be desirable in some part of the works to lay down the three sets of pipes so as to avoid further expense. Therefore, for these reasons, the Town Clerk and the Parliamentary Committee were proceeding for power to execute the whole of the works. But even assuming that they obtained power from Parliament to go to the Vyrnwy, they must come to the Council for power to raise £1,250,000 to carry out the first section. It would be gratifying to the Council to know that Mr. Deacon's estimates had been carefully gone over by Mr. Hawksley, and to a certain extent by Mr. Bramwell, and it had ended in their increasing his figures only 8 per cent. With this small increase Mr. Deacon's estimate was considered a full and fair one. The amount arrived at in round terms was—the first instalment, £1,250,000; the second, £750,000; and the third rather more. To that had to be added the cost of filtration if required, and also the interest and parliamentary expenses.

Mr. Simpson said he objected to the motion on the ground that the scheme which was represented to the ratepayers, and upon which their votes were taken, was to cost only £1,250,000, whereas it now appeared that the cost would be £3,500,000, which, he thought, did not reflect creditably on those who "got the scheme up," because they must have known at the time they asked the town to vote for the expenditure of £1,250,000, that the sum would ultimately be £3,500,000. His next objection was as to the manner in which the votes were taken. Many persons did not have voting papers at all, and in other cases the voting papers were never collected. Further, he was not at all satisfied that there was such an immediate requirement of water as the Committee would have the town to believe. He proposed the rejection of the motion.

Mr. Rathbone said that although the town was originally only asked to decide a question involving £1,250,000, every one who understood the subject knew perfectly well what the ultimate intentions of the Water Committee were; and even if they did not, it was now too late to come forward at a meeting of this sort, and try to upset what the town had most deliberately and entirely approved.

Alderman Bennett opposed the motion, because the Bill had never been before the Council in its present shape. He strongly objected to the way in which the matter had been brought before the Council. The Bill had been compiled behind the scenes, and though he was a member of the Water Committee at the time, he was kept in ignorance of the clauses until it was too late to object to them. He, therefore, moved that the resolution be postponed until the clauses in the Bill had been gone through by the Council.

The Town Clerk said this amendment was not exactly in order, but it would be if worded as follows:—"That this special meeting be adjourned to next Monday, to enable the Council to consider the provisions of the Bill before voting on the motion now before the Council."

After some little discussion,

Alderman Bennett said he would not take up the time of the Council, but would withdraw the amendment.

Mr. Balfour thought Mr. Simpson's objection to the passing of the motion was a very reasonable one, because the Water Committee led them to believe that the scheme was to cost the town £1,500,000; and now they came for the sum of £3,250,000. He (Mr. Balfour) had asked the Chairman of the Water Committee for explanations, and the explanations he gave were entirely satisfactory to his (Mr. Balfour's) mind, and he believed they would also be satisfactory to Mr. Simpson's mind. He (Mr. Balfour) ventured to say that if the Haweswater scheme had been before the Council, and if the Council had adopted that at a cost of £1,500,000, the Council would now have been asked to vote not £1,500,000, but such a sum as would have embraced the whole of the outlay upon the Haweswater scheme for 50 or 100 years, just as the Bill now did with regard to the Vyrnwy. There was no alteration in the original estimates placed before the town, although the sum applied for was to be £3,250,000.

Mr. Forwood said that under ordinary circumstances it would be respectful in members of the Council, after the ratepayers had pronounced an opinion in favour of a scheme, to follow the wishes so indicated by the ratepayers; but they had this in mind, that the ratepayers had not the fact so clearly before them, at the time they gave their votes, as they could have wished, and the majority was of the narrowest possible kind. If it had been impressed upon the minds of the ratepayers that it was intended to put in the Bill a proposal to spend £3,250,000, he did not think they would have given the vote they did. Those in the Council knew that £3,250,000 would be required, but this fact was kept in the background; and there was little hope that when the Bill came to be gone through clause by clause they would be able to reduce the sum proposed in the clause referred to. When it was advocated that they should proceed for a water scheme, it was very strongly urged by the Chairman and the other members of the Water Committee that the new water supply was rendered absolutely necessary by the great growth of the out-townships; and they were promised, as one means of meeting the obligations cast upon the Council through the cost of the new scheme, that there should be an equalization of rates inside and outside the borough. And yet there was not one word in the Bill committing the out-townships to an equal charge for water with the borough. The ratepayers of the borough were to go to this great expense of promoting a Bill by which they would be compelled to continue what the Council had admitted was an anomaly—giving water to the out-townships at a cheaper rate than they did to those in the borough. It was quite obvious this was done to avoid opposition. The Chairman had stated that one reason why the estimate of £3,250,000 would be required was for interest on the outlay; he (Mr. Forwood) presumed Mr. Wilson meant interest during the cost of construction. He was surprised the Chairman should state this, because in the Bill there was this clause: "All moneys raised under the powers of this Act shall be applied only for purposes authorized by this Act to which capital is properly applicable." He failed to see one word in the Bill by which they could charge to capital interest on money they borrowed. The result would be that during the seven years the works would be in construction the present ratepayers would have to bear the cost of interest—about £600,000 or £700,000, or something like 3d. or 4d. in the pound. Then he thought they were unwise in going into a parliamentary contest on the scheme at the present time. At the end of six or eight weeks there was every reasonable probability that there would be a dissolution of Parliament, and the whole of the £30,000 they had so far spent in promoting the scheme would be thrown away, and all the expense of applying to Parliament would have to be incurred over again. They would see by the very small number of Private Bills promoted this session that private people saw this risk in advance; and he was surprised that the Corporation of Liverpool should throw away a large sum of money in promoting a Bill with this fact staring them in the face.

Mr. Bower denied that £3,250,000, as the charge for the Vyrnwy scheme, was hanging over the heads of the ratepayers, and maintained that the Water Committee were simply pledging the Council to the cost of the first instalment. What the Committee were endeavouring to carry out was this: Whilst they retained in the hands of the present Council the power to deal with the cost of the first instalment, they wished that any future Council of 15 or 20 years hence should have the sole power of dealing with the second instalment—that was to say, whether the then Council would go on with the second instalment or not. They also desired to retain in the hands of the Council of a still more remote period the power of saying whether they would go into the expenditure for the third instalment. They had endeavoured to clear the ground so far as to prevent any future Parliament stopping the wishes of the town when the time arrived for them to take steps, if they thought proper to carry out the other sections of the scheme. They were going to do nothing at all but ask the town to spend money on the first instalment. Those who seemed surprised at the increase in the estimate evidently had not taken the trouble to refer to the Water Committee's reports, in which the estimates were given for the first and second instalments at, respectively, £1,253,000 and £730,000 in round numbers. The estimate for the third instalment was given, in the report of Nov. 27, 1877, at £871,000; and the amount for filtration (if it became necessary) for the entire three instalments was put down at £174,000. So that they were not asking the town to do anything more than to find the amount of the first instalment when the time came, and it was not true that the Committee had kept the public blind to the real facts. If they showed weakness at all, they would only be encouraging opposition; but if they showed earnestness and straightforwardness of purpose, with a determination to carry the scheme, the opposition would decrease, which, he was happy to say, it had done at the present time. As to a National Water Supply, if that was ever carried out, it would only be after the large towns had provided for themselves such supplies as were necessary. Then, possibly, some amalgamation scheme might be carried out; but the Government would never carry out schemes in the first instance, until the towns came forward and looked after their own interests.

After some further discussion, and the reply of Mr. Wilson, who asked for an unanimous vote to strengthen the position of the Committee, the motion was put and carried by 39 votes to 8.

The preamble and the first 28 clauses of the Bill were sanctioned without discussion.

On clause 29 being moved, which provided that all moneys raised under the powers of the Act should be applied only for purposes authorized by the Act to which capital is properly applicable,

Mr. Forwood asked if interest during construction could be paid from that source.

The Town Clerk replied that, if the Council wished it, the Bill might be amended, charging to capital interest during construction.

Mr. Forwood moved that this be done.

Alderman Jennings seconded the motion, which was agreed to.

Clause 30 was agreed to without discussion, and the next and concluding clause of the Bill was read, which was to the effect that the costs, charges, and preliminary expenses incidental to the preparing and applying for the Bill, and other costs in connection therewith, be paid out

of the public funds or rates in the hands of the Corporation, or hereafter to accrue to them, on the "Liverpool Water Account."

Mr. Forwood asked if these costs could be charged out of the capital account or out of the rates.

The Town Clerk: I am afraid it must come out of the water account. You had better leave it as it is, I think.

The Mayor took the opinion of the Council, and it was resolved to leave the clause as it stood.

Mr. Wilson formally moved the adoption of the Bill, which was passed without discussion.

The Cheltenham Corporation and the Liverpool (Vyrnwy) Water Scheme.—A special meeting of the Cheltenham Town Council was held on Monday, the 19th inst.—the Mayor (Alderman Nash Skillicorne) in the chair—for the purpose of considering the propriety of opposing the Bill being promoted by the Liverpool Corporation for the supply of Liverpool with water from any of the Severn tributaries, and, "if so determined, of approving and sanctioning the costs and expenses of, and in relation to such opposition." The Corporation have *locus standi* in relation to the Severn, having acquired the right, by the purchase of the late Water Company's undertaking, to abstract some 3 million gallons a day from the river, and being the owners of the works by which Tewkesbury is already supplied from the Severn. Mr. Parsonage, the Chairman of the Water Committee, brought up their report and moved the adoption of it. It set forth the objections to the Liverpool scheme as generally acquiesced in by the other towns opposing, and pointed out that the right the town had of abstracting water from the Severn was one of increasing value, as the river was freed from pollution, and ought to be carefully guarded from any depreciation. The report concluded thus: "Your Committee are of opinion that the Liverpool scheme, in its present form, may be prejudicial to the interests of the town and district, and recommend that a deputation from the Council join in the deputation to the President of the Local Government Board, and that the Bill be petitioned against, but that the question of further proceedings be adjourned until after the deputation has been received." Alderman Wilson seconded the adoption of the report with its closing recommendation. Alderman the Baron de Ferrières proposed as an amendment—"That no action be taken," ridiculing the idea that the proposed abstraction of water by Liverpool could make any appreciable difference in the volume of the Severn, and arguing that a town of the size of Liverpool ought not to be lightly obstructed in its effort to obtain water, and that the old-world notion of confining a town to its own watershed was yielding to the exigencies of increasing population. Mr. Barnfield seconded the amendment. After a somewhat warm discussion, the report of the Committee was adopted by 11 votes to 8.

SUGGESTIONS FOR DEALING WITH LONDON SEWAGE.

By Major-Gen. H. Y. D. Scott, C.B., F.R.S.

[A Paper read before the Society of Arts.]

(*Concluded from p.* 99.)

It is usual with agricultural chemists to consider the nitrogen associated with organic matter, which freely decomposes, to be as valuable as nitrogen in the form of salts of ammonia; for instance, in guano, of which about one-half the nitrogen exists in the form of ammoniacal salts, and the other half as nitrogenized organic matter, which has still to pass into the form of ammonia before it becomes operative on vegetation, this latter half is considered as valuable as the first, owing to the quickness with which it changes into the ammoniacal condition. In nightsoil, the rapidity of its decomposition also raises its nitrogen to the rank of nitrogen in the form of salts of ammonia; but when fœcal matters have been washed with water, so that they become less liable to putrefaction, and are mixed with other nitrogenous compounds, such as hair, vegetable *débris*, &c., which do not so readily decompose, some deduction from the value of the nitrogen should be made. Accordingly, Dr. Voelcker, when analyzing different samples of sewage manures for the report on sewage disposal by Messrs. Rawlinson and Read, whilst assigning to the nitrogen the same value as if it existed as ready-formed ammonia, stated expressly that he did so in order to avoid the charge of having put too low a value upon these manures; and in speaking upon the same subject at the Institution of Civil Engineers, on the 28th of March, 1876, the price of ready-formed ammonia being at that time 16s. per unit, he said that 15s. per unit would be too high for the value of nitrogen reckoned as ammonia, before its conversion into such. Consequently, Dr. Voelcker estimated that the calculated value of nitrogen, not already converted into ammonia, should be less than the value of ready-formed ammonia by at least 6⅓ per cent. on the value of the latter. Probably, therefore, we may safely calculate nitrogen, before conversion, as being worth 10 per cent. less than the market value of nitrogen in ammoniacal salts, such as sulphate of ammonia. The market price of this substance is at present 20s. per unit. I will, therefore, take the nitrogen at 18s. per unit. Concerning the value of phosphoric acid, which varies considerably as it exists in a condition either of insolubility or of solubility, I must speak at some length; this material being one I propose to add to the sludge, as I shall hereafter explain, in such a manner as to convert the ingredient into precipitated phosphate of lime. Any error in its assumed value is, therefore, of especial importance.

Dr. Voelcker made a very exhaustive series of experiments for the Royal Agricultural Society, on the solubility of phosphatic materials, and he drew the following conclusions, amongst others, from his investigations:—"Pure and dried phosphate of lime is sparingly soluble in water." "In a moist state, and in the voluminous condition in which it is obtained by precipitation from its solution, it is about four times as soluble in water as it is after it has been dried and heated." "The earthy phosphates in Peruvian and phosphatic guanos, still containing a good deal of organic matter, or salts of ammonia, are sufficiently soluble in water to be readily appropriated by plants." And in a letter to me, Dr. Voelcker writes: "The absence of acidity in the manure is an advantage when it is applied to land deficient in lime. There are many such soils, and on these phosphoric acid, in the shape of precipitated phosphates, produces a better effect upon vegetation than phosphoric acid in the shape of an acid soluble superphosphate, for unless the acid is rapidly neutralized by the alkaline elements (notably the lime in the soil) and precipitated in the soil, it cannot benefit the crop to which the superphosphate is applied. On the other hand, if there is a sufficient amount of lime or of other basic constituents in the land to precipitate the phosphate in superphosphate, I consider it better, as regards the distribution of phosphoric acid in the land, to apply the manure in the shape of superphosphate than in the form of precipitated phosphate. It is, moreover, impossible to distinguish by chemical means, with any great degree of accuracy, precipitated from ordinary phosphate of lime, and, in consequence, purchasers of manure will regard a guaranteed percentage of phosphates, actually soluble in water, with more favour than a guaranteed percentage of insoluble phosphates which may be present in a manure, partly as precipitated, and partly as ordinary insoluble phosphates;" and he suggests that a firm should sell manure, in which precipitated phosphates occur in plenty, "without any analytical guarantee, but on an established reputation for introducing into the manure precipitated phosphates only," and thus "give the public a reasonable guarantee they are really present in a precipitated form."

It would appear, then, that Dr. Voelcker looks upon precipitated phosphates as being intrinsically little inferior, and for some soils superior to acid superphosphate, and, as far as agriculture is concerned, the precipitated might be substituted for the perfectly soluble phosphate, without appreciable loss of manurial efficacy. The difficulty lies in the analysis, and is essentially a technical one, which it is to be hoped chemists will find the way of overcoming, as precipitated phosphates are brought more into use. Indeed, there are some who are already commencing to listen to the complaints raised against such unjust valuations of manure as are given by chemists in respect of precipitated phosphates, and Mr. Sibson, in his useful little work on artificial manures, says: "The identification of this form of phosphate (reduced or precipitated phosphate) being thus often a matter of importance, I now give its approximate amount when so required; at the same time I should plainly state that I consider it distinct from soluble phosphate;" and he gives the following scale of prices per unit, for fertilizers for 1878, such prices "being intended to apply to the purchase of manures under the circumstances usually prevailing in agricultural districts, when they are supplied in bags, carriage paid, and credit given. When bought in quantities in bulk for ready money, or fetched from the works, of course a lower scale would apply.

Price per unit for—	£	s.	d.
Soluble phosphate	£0	4	6
Ditto in mineral superphosphates	0	4	0
Precipitated phosphates	0	3	6
Insoluble phosphate (bone or guano)	0	2	6
Insoluble mineral phosphate, up to 7 per cent.	0	1	0
Potash sulphate	0	3	6
Ammonia	1	0	0

There can be no doubt that precipitated phosphates mingled with the decomposing matters of sludge—a very putrescible substance—are under conditions highly favourable to solubility. As may be seen from the investigations of Dr. Voelcker, ammoniacal salts materially increase the solubility of phosphates. And since, as is well known to chemists, phosphate of lime is easily soluble in carbonic acid, and both ammonia and carbonic acid result from the decomposition of the organic substances, there seems no reason for giving to precipitated phosphates in sludge-manures a lower value than that assigned to them in Mr. Sibson's table, under the terms of sale to which that table is intended to apply. To the phosphates naturally accompanying the organic matters which the sludge contains, we should assign the same value as for bone or guano.

Let us now investigate the cost of producing precipitated phosphate of lime, intermingled with sludge. I should premise that, as our object is not the preparation of a dry superphosphate, such as is manufactured for the market, a much freer supply of water is admissible than in the ordinary process of manufacture, where a dry powdery condition is essential in the finished product—a condition, moreover, somewhat difficult to obtain. The use of plenty of water much facilitates the process of solution, by enabling the acid to act more freely and perfectly on the mineral. It also does away, in great measure, with the noxious fumes evolved in ordinary superphosphate making, so that the process can be carried on without any extraordinary precautions. The mixing may be effected in strong wooden troughs, about 9 ft. by 4 ft. by 3 ft., pitched inside, and the dilute acid and mineral, finely powdered, should be stirred together for some minutes, until all action ceases. For one charge of a vessel such as the above, there will be required about 20 cwt. of Cambridge coprolites and 17 cwt. of brown sulphuric acid; or if mineral phosphates, with less carbonate of lime than Cambridge coprolites, be used, a little less acid is needed. Enough water should be used in order to leave the mixture in a more than semi-fluid condition—in a state, in fact, which admits of being readily mingled with the sludge. This sludge must have previously had mixed with it a sufficiency of milk of lime to leave the mixture alkaline after the application of the phosphoric acid.

The cost of bringing the phosphoric acid into solution, and of adding the lime, will be as follows. I obtain the proportions, excepting for the lime and the water, from Mr. Sibson's work on artificial manures, from which I have also taken the above account of a suitable mixing trough:—

		£	s.	d.
20 cwt.	of Cambridge coprolites, ground	£3	5	0
17 „	brown acid, at £4	3	8	0
5½ „	quicklime, at 16s.	0	2	8
9 „	water		*nil.*	
Labour of mixing 2¼ tons of dry solid matters and wear and tear of troughs		0	2	4
2¼ tons of dry solid matter, containing 1600 lbs. of tribasic phosphate of lime, cost		£6	18	0

Being a little less than 2s. per unit for a material which Mr. Sibson values at 3s. 6d. per unit, delivered to the consumer in bags, carriage paid.

There would then appear to be a fair profit on the treatment of phosphatic materials, if introduced in this way into a manure which would find a market. I shall now proceed to show that there is every probability of being able to dispose of this manure at a price approaching that at which its constituents would be valued by chemists.

Let us first, however, consider the value of the fertilizers already existing in the sludge, to which it is proposed to add lime, and subsequently a solution of superphosphate, and thus to precipitate the soluble phosphate. From the scale of prices by Mr. Sibson, given above, we shall have to deduct from the value assigned to the ammonia 10 per cent., owing to the fact that in sludge this compound has no existence, nitrogen only, capable of forming it, being present. This will reduce the value to 18s. per unit, and our figures will stand thus:—

		£	s.	d.
66·50	organic matter (without nitrogen)		*nil.*	
3·50	nitrogen (= 4·25 ammonia), at 18s. per unit	£3	16	6
6·07	phosphate, at 2s. 6d. per unit	0	15	2
1·25	potash (= 2·30 sulphate of potash), at 8s. 6d. per unit	0	8	0
22·68	sand and other minerals		*nil.*	
100·00		£4	19	8

In order to ascertain the quantity of precipitated phosphate which should be added to the manure, let us see what proportion is necessary to give the utmost effect to the above amount of ammonia. I should here point out that phosphates have been proved to be the ingredients without which plants cannot thrive, or even live. If any of the other mineral elements found in plants are absent from a soil, the plants may become stunted, and bear a very low crop of fruit, but they pass through the cycle of life. If phosphates are absent, however, they soon die. "Phosphates, therefore, not only themselves aid in the nutriment of plants, but they determine the beneficial action of the other mineral ingredients;" and, as Liebig says, "the phosphoric acid ensures and increases the action of the ammonia." Dr. Voelcker is of opinion that, for a manure for general purposes, the proportion of the phosphate of lime should be to the ammonia of the manure as 4 is to 1. M. Ville specifies that the phosphate of lime should

be to the ammonia in ratios varying from about 4 to 1½ to 4 to ½, according to the nature of the crop. If we assume, therefore, Dr. Voelcker's decision to be approximately correct for a general manure, we shall have to add to the sludge about 8½ per cent. of precipitate phosphate, after which its composition and value would stand thus. But in order to avoid any appearance of making out too good a case for my project, I will value the finished manure on a scale which can scarcely be cavilled at by the most arrant unbeliever in the efficacy of sewage manure. The valuation of the ammonia is that adopted by Dr. Voelcker in Messrs. Rawlinson and Read's report—namely, 8d. per lb. This price was based on the then market price, which was unusually low.

50·15 organic matter (without nitrogen)		*nil.*	
2·64 nitrogen (= 3·21 ammonia), at 15s. per unit	£2	8	2
4·58 phosphate associated with the sludge, at 2s. per unit	0	9	2
8·23 precipitated phosphate (added to sludge), at 2s. 6d. per unit	1	0	7
1·73 potash sulphate (= 0·9 potash), at 3s. 9d. per unit	0	3	4
16·08 sulphate of lime, &c., from superphosphate		*nil.*	
16·55 sand, &c.		*nil.*	
99·96 value estimated on the perfectly dry manure	£4	1	8

Dr. Voelcker, in reporting to Messrs. Rawlinson and Read on samples of sludge manure submitted to him by them, says: "It is manifestly practically wrong to estimate the money value of such bulky and poor manures by the same standard of prices at which the commercial value of guano, bone dust, sulphate of ammonia, and similar concentrated artificial manures are estimated. A more rational and correct estimate of the true value of sewage and nightsoil manures is attained by comparing them with ordinary farmyard manure, and the price which is paid for the latter;" and he expresses the opinion that the utmost a farmer can afford to pay for good dung of the theoretic value of 15s. per ton, if he has to cart it half a mile, would not exceed 7s. 6d., or half its estimated value.

On the other hand, he thinks that manures sell better at the value of £8 8s. per ton, than if they have a higher value. Manifestly, therefore, if he is right in his view, at this price the theoretic and market values of manures should coincide. I think, indeed, I might venture to say that he considers they do so, even at the price of £6 per ton. Some deduction, in any case, must therefore be made from the value at which the above estimate of the mixture of prepared sludge and precipitated phosphate works out, and what this deduction should be may, perhaps, be best arrived at by following the course pursued by Messrs. Hofmann and Witt, to show the disadvantages of feeble manures. I may then, for simplicity's sake, suppose the one manure to have a value of £8, the other of £4, without entailing an error of any consequence. Thus:—

Price of one ton of good manure at factory	£8	0	0
Spreading	0	0	9
Total	£8	0	9
Price of two tons of sewage manure at factory	£8	0	0
Spreading	0	1	6
Total	£8	1	6
Price of one ton of good manure at factory	£8	0	0
Carriage for two miles	0	2	0
Spreading	0	0	9
Total	£8	2	9
Price of two tons of sewage manure at factory	£8	0	0
Carriage for two miles	0	4	0
Spreading	0	1	6
Total	£8	5	6
Price of one ton of good manure at factory	£8	0	0
Carriage for five miles	0	5	0
Spreading	0	0	9
Total	£8	5	9
Price of two tons of sewage manure at factory	£8	0	0
Carriage for five miles	0	10	0
Spreading	0	1	6
Total	£8	11	6

Therefore, at a distance of five miles, there is a relative disadvantage in using the sewage manure of 5s. 9d.; and, at a distance of two miles only, of 2s. 9d. If we say, then, that the manure—allowing for 10 per cent. of water, which it should contain—has a value of £3 10s. per ton, we probably shall not be far from the price which would be given for it by farmers, when once they understood its merits, within a radius of four or five miles from the manufactory. In such situations as those which would be occupied by the works on either side of the river, the market would by no means be limited to a radius of five miles from them; for, with water carriage, the farmers along the whole course of the river would probably draw their supplies of manure from these factories. If the sales would even cover the expenses of manufacturing the manure, as the process would be the means of keeping the most deleterious part of the sludge out of the river, it manifestly would be inexcusable to continue to throw the solids into the Thames. Let us see, then, what these expenses would be.

The first operation, when the supernatant water is drawn off from the deposit (which will consist of about nine parts of liquid to one of solid), is to add to the sludge about two-thirds per cent. of quicklime, slaked, and made into milk of lime. This is effected by running the milk over it, and then stirring the compound, which will effectually deprive the sludge of noxious smell. The next step must be to mix with the limed sludge such a quantity of the prepared superphosphate as will nearly, but not quite, neutralize the lime previously added. The mixture now becomes surprisingly inodorous, considering the origin of the greater part of it; the organic matter also loses its slimy, glutinous nature; and assisted by the precipitated phosphates and the crystalline sulphate of lime intimately incorporated with it, the compound drains and dries with comparative rapidity.

These additions will cost for materials about 16s. 6d. per ton of prepared manure, as may readily be seen by valuing the precipitated phosphate contained in it at 2s. per unit, which we found to be the cost of making it. To remove the sludge from the tanks and to dry it, including all the expenses of treatment, except the cost of building tanks, will amount to about 20s. per ton. This gives as the profit on the manure (£3 10s., less £1 16s. 6d.), £1 13s. 6d. per ton; or, say, £1 10s. per ton.

Sir Joseph Bazalgette estimated a few years since that, roughly speaking, each gallon of sewage water carries down with it 100 grains of suspended matters, and the daily discharge, Captain Calver says, is 120 million gallons in dry weather. This would yield 279,225 tons of solid matter per annum, which quantity Captain Calver thinks too low an estimate. This estimate is, however, considerably higher than would follow from the analyses given by Hofmann and Witt, and by the Rivers Pollution Commissioners. I do not think that it can be assumed that the organic matter is more than from 50,000 to 55,000 tons per annum, and, if we add to this, for detritus and mineral matter, double its weight, as found in the outfall sewage by Professor Williamson, we arrive at only 150,000 or 165,000 tons of solid suspended matters per annum; whereas, with Dr. Letheby's estimate, we should get no more than 116,000 tons, and from the analyses of the Rivers Pollution Commissioners, and Drs. Hofmann and Witt, only 130,000 tons per annum. Concerning the quantity of solid organic matter in Thames sewage, we may speak with much more confidence, then, of the quantity of the solid mineral matter. Different estimates of the former vary less than 5 per cent.

Taking the lower of the above estimates, so as not to overstate my case—say 150,000 tons—it may readily be seen from the analyses that we may reasonably hope to effect a rough separation of the deposit. Thus, in a first set of depositing-tanks, we should keep back four-fifths of the heavier particles, entangling with them only a small proportion of the organic matter; and, in a further set of tanks, in which the sewage would be brought to complete quiescence, we might recover four-fifths of the organic matter (or 40,000 tons), mixed with half its weight of mineral matter, making a total of 60,000 tons available for the manufacture of a manure.

To this 60,000 tons we have to add about one-third for the phosphates, &c., mixed with them in the manufacture, giving us, as the total amount of manure, reckoned dry, 80,000 tons, or with the moisture, which we will take at 10 per cent., say 88,000 tons.

The question of what is to be done with the sand or silt deposit, amounting to 90,000 tons per annum, must also naturally suggest itself. What ought not to be done with it is quite certain; we ought not to cast it into the river. It may be quickly dealt with, and rendered perfectly clean, by passing it through one of Fryer's destructors, heated with waste cinders, which are now a drug in the market, and most difficult to dispose of; or it might be used for reclaiming a portion of the marshes at the expense of pumping it to some little distance, as was suggested by one of the Royal Commissions in reference to the whole of the deposit. Surely even this last plan would be preferable to putting it into the river and dredging it out again, and then having it still to dispose of.

If the Metropolitan Board take measures to keep out of the river the whole of the suspended matters which will deposit in tanks of a size moderate as compared with the total volume of sewage water, they will have done much towards rendering the London sewage practically harmless, as will be readily apparent from the following statements in the reports of various Royal Commissions:—

> The chief part of the nuisance arising from the discharge of sewage into the rivers and streams may be obviated by simply arresting the solid matters in the liquid.
>
> By far the greatest part of the solid matter which is held in suspension in water is readily deposited in rivers, covering the banks with mud, permanently raising the beds, gradually destroying the scouring power, and partially silting such rivers up.
>
> That, however the appearance of the water may be improved after these deposits have taken place, yet the deposited matters lying in the bed of the current are under conditions favourable to putrefaction, and when the foul mud is disturbed by the prevalence of rain and during floods, it sends forth its effluvia among the populations which are near, and even, in the course of the rivers, far distant.

In short, successive Royal Commissions have repeated the truths told to the Metropolitan Board by their own advisers, Messrs. Bidder, Hawksley, and Bazalgette, in their report on the main drainage. They have further informed them that "covered reservoirs, of moderate size, ought to be constructed near each outlet, for the reception of the sewage water until it shall be discharged during the first hours of the descending tide, or to enable it to be defecated by lime or other chemical agent" (Report, p. 99) "before admission into the river," with a view "to the realization of its fertilizing contents, if such should hereafter become commercially valuable." (Report, pp. 98-99.)

In the foregoing recommendation, then, I have not exceeded that which Sir Joseph Bazalgette himself thought imperative upwards of 20 years ago, when his main drainage scheme was devised; but in order that the sludge to be used for manure may not be degraded by the mixture with it of a bulky precipitate of carbonate of lime, I have suggested that the coarser mineral suspended matters may first be allowed to deposit in a subsiding tank, and next that the sewage may be given a period of greater rest in order that the suspended organic matters may separate from the liquid, and be made available for manurial purposes. Finally, I would urge upon the Metropolitan Board the importance of carrying out the recommendation of their present adviser, given when he was acting with the above gentlemen, and I would recommend them to take steps for making the defecation of the sewage perfect by precipitating it with milk of lime. Subsidence alone will not effect the perfection of clarification which the nation might fairly require, if the sewage of London is to be thrown into the noblest river they possess.

If this further treatment be undertaken, it gives us another large quantity of worthless matter to be disposed of. For by using 12 grains of lime per gallon, it would, with the carbonate of lime derived from the sewage water, and other matters thrown down, occasion a total deposit of quite 220,000 tons per annum. This I would deal with in one or the other, or all of the following methods:—

1. By adding the proper proportion of clay, to be obtained from the river banks, with the requisite amount of milk of lime, so as to enable the deposit to be burned into Portland cement, as is now done at Burnley, under much less favourable conditions than would exist under the circumstances I have pointed out.

2. By re-burning the precipitate, and using it for a fresh portion of sewage. This operation might be repeated six times, after which the calcined deposit might be used for the manure process, or it might be sold for phosphatic agricultural lime. The phosphoric acid thus recovered would be worth upwards of £20,000 per annum.

3. By selling the deposit as a top dressing for land, for which purpose farmers might be willing to give for it, say, 1s. per ton pumped into barges.

I have endeavoured to put my suggestions to you without any exaggeration, and I now commend my estimates and figures to the attention of those interested in this question, and capable of examining into the accuracy of my deductions. The only point on which I myself see any grounds for doubt is on the question of what proportion of the detritus it is practically possible to separate from the organic matters. To effect such a separation as I have assumed would not, I submit, be a difficult task for engineers, and the experiment could be made at a trifling expense. The cost of the tanks, if executed in concrete, would probably not exceed £100,000, and as the sale of the manure might be expected to realize £132,000 per annum, it would certainly be sufficient to cover the interest on this sum, together with the expense of disposing of the sand.

I trust that the Metropolitan Board of Works will give their careful

attention to these figures, and, at any rate, attempt to keep out of the river all that can be detained, without further taxing the ratepayers of the Metropolis. The only reasonable objection that can be urged against my suggestions is that there might be a difficulty in finding a market for so large an amount of manure of a comparatively low standard. If those in authority turn a deaf ear to my arguments, I venture to hope that Parliament itself will intervene, and no longer bestow upon the Thames the unenviable distinction of being the only filthy river in the country.

AMERICAN GASLIGHT ASSOCIATION.

[Abridged from the "Official Report" in the *American Gaslight Journal.*]

(*Concluded from p.* 96.)

Mr. W. W. Goodwin (Philadelphia) read a paper entitled

THE ECONOMY OF GAS AS A FUEL FOR COOKING PURPOSES.

He said: I have a statement of facts—the results of some experiments—which I will present to the Association without comment. I have also prepared a tabulated record of tests made by boiling a giving quantity of water over a flame composed of different portions of gas and air under varying conditions, in order to determine which was the best quantity of air to introduce into gas to secure the most favourable results.

My standard was 8 lbs. of water. The gas was consumed at the rate of 10 feet per hour; and the time required to raise 8 lbs. of water from 73° to the boiling point was 28½ minutes, consuming 4·466 feet of coal gas. I would say here that I designed an apparatus for furnishing air in a measured quantity, and mixing it with the gas before burning. The apparatus is so arranged that the gas and the air can be put into the burner in their normal condition, or the gas and the air can be heated both together or separately.

Tabular Record of Tests on Boiling Water over a Flame Composed of Different Proportions of Gas and Air, under Different Conditions.—Coal Gas, 16½-Candle Power. Weight of Water, 8 lbs.

—	No. of Trial.	Temperature of Water.	Increase of Temperature.	Time Required.	Gas Consumed.	Per Cent. Less Time.	Per Cent. Less Gas.
		Deg.	Deg.	Min.	Feet.		
Test No. 1. Pure gas at the rate of 10 feet per hour.	1	80	132	28·5	4·5	—	—
	2	76	136	28·5	4·4	—	—
	3	76	136	28·5	4·5	—	—
	Average	77·33	134·6	28·5	4·466	—	—
Test No. 2. 1 volume of gas to 1 of air.	1	80	132	22·5	3·6	—	—
	2	74	138	23	3·6	—	—
	3	74	138	23	3·6	—	—
	Average	76	136	22·83	3·6	20	19
Test No. 3. 1½ volumes of air to 1 of gas.	1	78	134	22	3·4	—	—
	2	76	136	22·25	3·5	—	—
	3	76	136	22	3·5	—	—
	Average	76·66	135·3	22·08	3·46	22·5	22
Test No. 4. 2 volumes of air to 1 of gas.	1	79	133	21	3·3	—	—
	2	76	136	21·5	3·4	—	—
	3	76	136	21·5	3·4	—	—
	Average	77	135	21·3	3·32	25	25·5
Test No. 5. 2½ volumes of air to 1 of gas.	1	71	141	21·25	3·3	—	—
	2	74	138	22	3·5	—	—
	3	76	136	21	3·2	—	—
	Average	73·66	138·3	21·4	3·3	26	21·6
Test No. 6. 2½ volumes of cold air to 1 of heated gas.	1	73	139	28	4·1	—	—
	2	74	138	26	3·8	—	—
	3	74	138	27	3·9	—	—
	Average	73·66	138·3	27	3·93	5·2	11
Test No. 7. 2½ volumes of heated air to 1 of heated gas.	1	74	138	27	4·0	—	—
	2	74	138	26·5	3·9	—	—
	3	74	138	26·75	3·9	—	—
	Average	74	138	26·75	3·93	6	11
Test No. 8. 2½ volumes of heated air to 1 of cold gas.	1	74	138	26·5	3·9	—	—
	2	75	137	26·25	3·8	—	—
	3	76	136	26	3·8	—	—
	Average	75	137	26·25	3·83	7·8	12

In the first test the gas was cold and the temperature of the water was 77½° Fahr.

After determining the quantity of coal gas required to boil 8 lbs. of water, I mixed various quantities of air with the gas, with the following results, each test named being an average obtained from three trials, viz.:—

In the second test 8 lbs. of water were used and 1 volume of air and 1 volume of gas. The quantity of gas consumed was 3·6 feet. In that case the boiling point was reached in 22·83 minutes, being 20 per cent. less time required, and 19 per cent. less gas than in test No. 1.

The third test was 1½ volumes of air, 1 volume of gas, and the same quantity of water. Time, 22·08 minutes; gas consumed, 3·46 feet, or 22·5 per cent. less time, and 22 per cent. less gas than in the first test.

The fourth test was 2 volumes of air and 1 of gas. Time, 21·3 minutes; gas consumed, 3·32 feet; or 25 per cent. less time, and 25·5 per cent. less gas required than in the first test.

The fifth test was 2½ volumes of air and one of gas. I will state that I found the best results were obtained with this mixture. It has been found, in Europe, that 2½ volumes produce the most favourable results. The candle power of the gas has something to do with it, I presume. This is certainly a very close comparison. In this test the quantity of gas consumed was 3·3 feet; the time occupied was 21·4 minutes; or 26 per cent. less time, and 26·1 per cent. less gas required than in the first test.

In the sixth test the gas was heated, and the time went up to 27 minutes; quantity of gas consumed, 3·93 feet; reducing the time to 5·2, and the gas to 11 per cent.

The seventh test was heated gas and heated air. The time required was 26·75 minutes; quantity of gas consumed, 3·93 feet; or 6 per cent. less time, and 11 per cent. less gas.

The eighth test was heated air and cold gas. Time, 26·25 minutes; consumption of gas, 3·83 feet; or 7·8 per cent. less time, and 12 per cent. less gas.

In tests Nos. 6, 7, and 8 the air and gas were heated separately in coils of copper pipe over separate flames, arranged so that the air or the gas could pass through the coils or not, as was desired. Each of these coils had a heating surface of 472 square inches, and in the tests the tubes were heated to redness. The conclusion is that the best condition for burning gas, according to these tests, is 2½ volumes of air and 1 volume of gas, and both of them in their normal condition, or cold.

The paper then entered into minute details of a number of experiments made to ascertain the relative efficiency of an ordinary range and a gas-stove in the cooking of various kinds of edibles, the percentage of loss in weight, and the time required, being carefully noted. The viands were equally divided; and, in the result, it was found that, with the cooking range, the total time from the lighting of the fire until everything was ready to serve was 2 hours and 40 minutes. Of this time 30 minutes was required to heat the oven, leaving 2 hours and 10 minutes actual cooking time. Weight of coal used, including lighting of fire, 44 lbs. At the end of the time the fire was ready for more coal. Cost of coal, 44 lbs., at 5·50 dols. per ton, 10·95 cents; kindling, 1 cent.—total, 11·95 cents. With the gas-cooking stove, the total time from lighting the gas until everything was ready to serve was 1 hour and 50 minutes. The consumption of gas, by the test meter, was 38 feet, which (at 2·15 dols. per 1000 feet) cost 8·17 cents. The following is a table of the percentages of loss after cooking by the two systems:—

	Gas-Stove.	Range.
Fish	Cost . . . 35 c.	Cost . . . 35 c.
	Product. . 28½ c.	Product. . 24¼ c.
	Loss . . . 6½ c.	Loss . . . 10¼ c.
	Saving of gas-stove over range, 3¾ cents.	
Beef	Cost . . . 166½ c.	Cost . . . 169½ c.
	Product. . 138⅜ c.	Product. . 117 c.
	Loss . . . 28⅛ c.	Loss . . . 42½ c.
	Saving of gas-stove over range, 14⅜ cents.	
Chicken	Cost . . . 61¼ c.	Cost . . . 60 c.
	Product. . 52½ c.	Product. . 42½ c.
	Loss . . . 8¾ c.	Loss . . . 17½ c.
	Saving of gas-stove over range, 8¾ cents.	
Steak	Cost . . . 24¾ c.	Cost . . . 24¾ c.
	Product. . 20⅝ c.	Product. . 18⅞ c.
	Loss . . . 4⅛ c.	Loss . . . 6 1/16 c.
	Saving of gas-stove over range, 2 1/16 cents.	
Chops	Cost . . . 20 c.	Cost . . . 21¼ c.
	Product. . 16½ c.	Product. . 13¾ c.
	Loss . . . 3½ c.	Loss . . . 7½ c.
	Saving of gas-stove over range, 4⅛ cents.	

Total saving, 33¼ cents.

At the conclusion of the business,

On the motion of Mr. M'Ilhenny, a vote of thanks was passed to the President for his services in the chair; and, on the motion of Mr. Cartwright, a similar vote was passed to Mr. Nettleton for the manner in which he discharged the duties of Secretary of the Association during the years he filled that position, and from which he only retired at this meeting.

The vote was acknowledged in appropriate terms, and the proceedings ended.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Notwithstanding the severe weather, there has been no particular pressure for house-fire classes of fuel, and the supplies in the market have been amply sufficient to meet requirements, colliery proprietors in some cases being unable to move off all their production, and there has been a slight accumulation of stocks in waggons on the pit sidings. For other classes of fuel the demand improves slowly; but there will have to be a further considerable enlargement of requirements before the demand approaches the limits of production—at present much curtailed—in this district; and in the meantime colliery proprietors will have to content themselves with comparatively low prices. This, however, does not prevent a growing feeling of confidence as to the future, and now that there is the prospect of a steadily-decreasing competition from other large coal-producing districts, whose supplies are being absorbed for iron-making purposes, colliery proprietors here are not at all anxious to sell far forward, although many of them could do so without difficulty at the prices ruling in the market. The average quotations at the pit mouth are about as under:—First qualities of house coal, such as best Wigan Arley, 8s. 6d. to 9s.; seconds, such as common Arley and Pemberton four-feet, 6s. 9d. to 7s. 6d.; common round coal, 5s. 6d. to 6s.; burgy, 3s. 9d. to 4s. 3d.; good slack, 3s. to 3s. 3d.; and common, 2s. 3d. to 2s. 6d. per ton.

The advance in the price of coal for shipping purposes has given rather a check to this branch of business, and there is a considerable quantity of coal offering in the market at prices slightly lower than those which were being quoted a week or so back, steam coal delivered at the High Level, Liverpool, being offered at from 7s. to 7s. 6d., and delivered alongside at from 8s. to 8s. 6d. per ton.

It seems not improbable that the wages question in the coal trade will be shelved for a time. The employers are willing to give an advance as soon as there is an improvement in trade to justify such a step; but at present they decline to move, and there is little chance of the men obtaining any practical benefit by a strike.

So far as makers are concerned, a steady tone is maintained in the iron trade of this district, and for Lancashire pig iron, delivered equal to Manchester, quotations remain at 70s. per ton, less 2½ per cent., for both foundry and forge qualities. In some outside brands there has been rather an easier tone, owing to a good many second-hand lots having been put into the market. Finished iron continues very firm at advancing prices; some makers decline to quote at all, and it is difficult to say what are the actual prices, but £9 to £9 10s. is being asked for bars, delivered into the Manchester district. Founders, however, are not yet able to get very much better prices, and I still hear of pipes being quoted at very low figures, in some cases very little over £5 per ton.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The coal trade was quiet last week. The contracts made for gas coals are about completed. They show a rise of 6d. per ton since Christmas. In some instances, contracts have been entered upon to supply gas coals to the Baltic at the first open water. They have been made at 1s. a ton advance upon the rates of January, 1879. The shipping business done by small coasters in the English ports of the Channel in gas coals was

pretty considerable last week. In fact, more than two-thirds of the sailing tonnage which was engaged was for this trade. Some steamers and sailing vessels also loaded gas coals for the Irish ports. Coasting freights are easy. The rate has scarcely changed during the winter, and it is not likely to do so in the spring. Some contracts were completed last week for the very best qualities of coke. Straker and Love's sold at 20s. a ton. Secondary sorts are, of course, much below that quotation; but the business is very steady all round. Nearly all the contracts entered upon will run over the first half of 1880. Coke will be shipped to the Baltic at the first open water. The exportations of coke to Spain and the Mediterranean are not large at present. Manufacturing coals are in demand for local consumption. All the business done this week for deliveries over the year verify the statements which have been made in these columns on several occasions recently, that the advance in the rates for manufacturing coals upon the prices of the year 1879 is not likely to exceed 1s. per ton. That is absolutely so as regards the first half of 1880 at any rate. The same observation applies to most sorts of gas coals over the first half of the year, and without the iron trade advances in prosperity in longer strides over the second half of the year than it is likely to do in the first half, the rate will remain pretty much as quoted.

The iron trade of Middlesbrough, and the North of England generally, may be reported as unaltered. The shipments of iron to America are considerable. A number of large north country steamers are employed carrying iron from the Tyne, Tees, and Leith, to New York, Philadelphia, and Baltimore. The sales of iron to the United States are well maintained. It is pretty certain that more will continue to be made over 1880. The local demand for manufactured iron and metal castings is upheld.

The fire-brick trade is brisk. Some more good sales have been made, and prices continue to have a slightly upward tendency The lead trade is manifestly slacker. Merchants can scarcely maintain recent advances. The chemical market was a little dull last week. Soda yielded a trifle where sales were made for immediate delivery. Bleaching powder improved in value.

Although the timber business is steady and prices keep firm, and for some descriptions of wood bidders seek, and occasionally get more money, there is little change to note. Large timber from British America will realize an advance in prices this year. Indian teak is scarce and dear. There are likely to be pretty heavy importations of deals and battens from the Baltic after the opening of that sea. Stocks of timber are low in this country.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At the usual monthly meeting of the Police Board of Greenock, held last Tuesday, there were under consideration the minutes of the Gas Committee of the 13th of January, which showed that a report by the Manager had been submitted and read, in which he regretted that the unaccounted-for gas appeared to be on the increase, notwithstanding the measures that he had adopted throughout the course of last year, and which were still being carried out, with a view to ascertain and remedy the causes that, in either the piping or meter systems, might contribute to an excess in the direction indicated; and, further, desiring the sanction of the Committee to employ the necessary number of men to allow of a continuous and thorough investigation of the systems referred to during the ensuing season. The Committee expressed satisfaction with the Manager's endeavours, and granted him the permission asked to engage additional men for this work. In moving the adoption of the minutes, Bailie Shankland said that the loss was increasing every year, and the Gas Manager was unable to find out any material leakage. They had rather more leakage in Greenock than the average in other towns. The matter was important, as they lost from £2000 to £3000 every year. He subsequently admitted that the loss was more than that. Provost Campbell, who occupied the chair, said the amount was about £6000 or £7000—a large amount to be wasted. No doubt, he remarked, the laying of new pipes to Inchgreen (the site of the new gas-works), which was a large extension, might account for the increase of waste within the last year or two. He suggested that a small committee should be appointed to look after the matter, the said committee including as many practical men as possible, who would be able to help the Manager in his endeavours. The suggestion was approved of, as was also one to the effect that a statement should be laid before the Board, showing the production of gas, the cost, the revenue, and the waste—indeed, the Provost said he already had the information, and would put it at the service of the Gas Committee.

It was reported at the last monthly meeting of the Broughty Ferry Police Commissioners that the Sheriff had approved of the Provisional Order asking for powers for the extension of the gas-works, and, therefore, a Special Committee was appointed to superintend the preparation of plans and specifications, and with powers, if necessary, to visit other places.

Notwithstanding the fact that the town of Coatbridge is the chief centre of the iron trade of Scotland, with a population of nearly 20,000 inhabitants, it is still destitute of any system of public street lighting. That it should have remained so long in its present anomalous position, having no properly constituted body to administer its affairs, is a circumstance which seems somewhat extraordinary—at least to outsiders. About twelve years ago a strenuous effort was made to form the town into a borough under the Lindsay Act; but the movement was defeated through the influence of what has since been popularly known as the "Gartsherrie party." During the past twelve years that party has lost much of its former power, and there is every prospect now of the burgh movement being set on foot again, which it is hoped will be successful.

The quarterly report on the condition of the Aberdeen Water-Works shows that in the last three months of the past year four somewhat important cases of repairs were executed on the aqueduct, the water being shut off 27½ hours in all, while minor repairs to the number of 25 were carried out. On 70 days the sluice-keeper at the Invercannie intake reports the water to have been "very clear," on 6 days "clear," and on 15 days "brown;" while on one day—Nov. 16—the sluices were shut, and no water was taken from the river on account of its muddy state. The consumption, as measured at the two reservoirs, was 4,672,330 gallons for the 24 hours—4,444,000 gallons from the low service, and 228,330 from the high service reservoir. During the quarter repairs were executed in the city to 116 water-cisterns, 178 water-closets, 640 water-taps, and 118 burst pipes—these repairs being effected on the order of the surveyors of the private water supply.

Mr. Watson, Manager of the Dundee Water-Works, has just directed the special attention of the Works Committee of the Water Commissioners to the very great and systematic waste of water in the town, more especially during frosty weather. His report was approved of, and he was at once authorized to give notice that all parties persisting in wasting the water would be prosecuted.

A few days ago Mr. J. F. Bateman, C.E., F.R.S., Engineer of the new water supply scheme for the town of Forfar, visited the works, and expressed his satisfaction with the progress made. He thought it very probable that the people of the town would be enjoying the benefits of the water by the month of March next year. On the occasion of his visit to the north, Mr. Bateman also made an inspection of the new water supply works for the city of Perth, regarding which he reported in very favourable terms to the Water Commissioners. He says that the works are substantially completed.

For some time past the higher levels in and around Rothesay have been rather unsatisfactorily supplied with water, and the Town Council are at present engaged in carrying out a scheme by which these higher levels will have an abundant supply of pure water. The source is the Dhu Loch, which is situated at a height of 300 ft. above the sea level; and the scheme will cost £10,000. With this water supply, which will rise above the highest hill in Rothesay, and that from Loch Ascog, there is not probably another town that can be found better, if so well supplied with this necessary of life. The Dhu Loch scheme is now about completed, and in a few weeks the water will be introduced into Rothesay.

There were violent fluctuations in the Glasgow pig iron warrant market during the past week. As high as 72s. 3d. per ton cash was paid on Thursday, and down to 68s. 9d. on Friday afternoon, the close, however, being 69s. cash and 69s. 6d. one month for buyers, sellers asking 3d. more.

The demand for house descriptions of coal keeps fairly steady, but the shipping business is very meagre.

SALE OF SHARES IN THE EASTBOURNE GAS COMPANY.—On Thursday last, Mr. Towner sold by auction, at Eastbourne, six original A shares and several B shares in the Eastbourne Gas Company. The A shares realized £15 10s. and £15 12s. 6d. each; the B shares fetching from £12 7s. 6d. to £12 12s. 6d. each. The shares were sold inclusive of the dividend accruing from Christmas last.

THE PROPOSED PURCHASE OF THE PONTYPOOL GAS AND WATER WORKS BY THE LOCAL BOARD.—At the meeting of the Pontypool Local Board on Wednesday last, the Chairman (Mr. E. H. Davies) stated that a deputation had waited upon the Directors of the Gas Company, who expressed their willingness to sell the works at a reasonable price, and said they would recommend the Shareholders to agree to the proposal. The deputation had also waited upon the Panteg and Abersychan Local Boards, and had written to the Llanvrechva Board. The Abersychan Board, while inclined to entertain the proposal, thought if it were carried out it would be advisable to consult the Directors of the Abersychan Gas Company with reference to the purchase of their works as well, and a deputation had been formed for this purpose. Mr. Russell thought the Local Board had better leave the matter where it was; they had plenty to do without meddling with such things. The Chairman said the success of the scheme would depend upon whether the terms would be such as would make the purchase a paying speculation; but they all felt that the gas and water supply should be in the hands of the Board, if it would pay.

THE GAS SUPPLY OF LONG EATON.—Last Thursday, a public meeting was held at Long Eaton, for the purpose of considering the desirability of the Local Board taking over and managing the supply of gas in the parish. Mr. Newsum, who occupied the chair, said that the object of the meeting was to consider whether they as a public meeting should recommend the Local Board to purchase the gas-works. If it was decided to purchase the works, they must look to the market value of the shares, and pay accordingly. A resolution was proposed by Mr. Drennan to the following effect:—"That this meeting, being a parish meeting of the ratepayers of Long Eaton duly convened and constituted, is of opinion that the proposed Provisional Order relating to the Long Eaton Gas Company, Limited, will, if carried into effect, be injurious to the interest of the ratepayers and inhabitants of Long Eaton; and that the same should be opposed on their behalf by the members of the Long Eaton Local Board." Mr. W. Wallis seconded the motion, which, after some discussion, was carried by a large majority. Mr. Wallace then moved, and Mr. J. Austin seconded a resolution approving of the offer of £18,000 for the purchase of the gas-works. This was carried with two dissentients only.

DINNER TO THE EMPLOYÉS AT THE WIGAN CORPORATION GAS-WORKS.—Last Tuesday evening the *employés* of the Wigan Corporation Gas-Works held their annual dinner. Mr. J. G. Hawkins, the Manager, was in the chair, the vice-chair being occupied by Mr. Holt, the Borough Treasurer. The usual loyal and conventional toasts were given and responded to with much cordiality, and the Chairman then briefly proposed the "Health of the Members of the Wigan Corporation Gas Committee." He alluded in warm terms to the kindness displayed by the members of the Gas Committee on all questions relating to the welfare of the men, and said they were wishful in every way to promote their interests, so far as was consistent with the interests of the ratepayers. Mr. Airey replied on behalf of the Committee, and proposed the health of the Chairman. He congratulated the town on having a gentleman possessing the ability of Mr. Hawkins at the head of the gas department, and referred to the kindly feeling existing between the men and those whose duty it was to see that they did their work properly. The Chairman said he should always regard it as his duty to act kindly and considerately to the men under his supervision, knowing that they were all labouring with the intention of carrying on the gas-works for the benefit of the town. The health of the Borough Treasurer was then given; and also that of the visitors, the latter being proposed by Mr. Ralph Bolton. Thanks were accorded to the donors of the feast, and a number of songs, &c., were given, the proceedings throughout being of a most enjoyable nature.

Register of Patents.

3306.—WILKINSON, C. H., Slaithwaite, near Huddersfield, "*Improvements in unions or couplings for connecting pipes.*" Provisional protection only obtained. Dated Aug. 22, 1878.

These improvements consist in the employment of two flanges, having a nut on the back of each flange for the purpose of being screwed on to a pipe. On the face of one flange a projection or ring is formed, on which is placed a washer of india-rubber or other elastic material. This projection enters a corresponding recess formed in the other flange, so that when the two flanges are drawn together by bolts or other means a perfectly tight joint is made.

3322.—BODART, A., Huy, Belgium, "*Improvements in joints for pipes or tubes.*" Patent dated Aug. 23, 1878.

This invention refers to joints for pipes or tubes without sockets or flanges, the joint being composed of a leaden ring, two cast-iron coupling-rings, cement to solidify the joint, and a hoop for covering the coupling-rings. The ring is formed of a band or strip of milled or rolled sheet lead with a groove in the centre, and upon it are placed two cast-iron coupling-rings, having an internal flange against which the lead will be bedded. The free space in the coupling-rings is for receiving mastic or cement which hardens quickly. A hoop surrounds the coupling-rings, and prevents one of the pipes sinking below the other if the pipes are placed in soft ground. It also serves for preventing foreign substances getting into the groove in the ring.

3334.—ATKINS, T., Clapham, Surrey, "*Improvements in the construction and arrangement of machinery and apparatus for the manufacture of compound carbonaceous materials, and gases generated therefrom, for increasing the illuminating power and purifying coal gas, and in using and applying the products derived therefrom to various useful purposes.*" Patent dated Aug. 24, 1878.

The first part of this invention relates to the construction of small portable retorts, cylinders, or tubes provided with small outlets for the escape of the gases evolved from the materials employed. The second part relates to improvements in the construction of cylinders and pistons of various diameters for the manufacture of globular and angular compounds of carbonaceous material, whether of the mineral, animal, or vegetable kingdom. The third part relates to improvements in fire-grates or furnaces made of fire-brick, wrought or cast iron, or such material as may be found most suitable for the purpose. The fourth part relates to the construction of ovens for baking or carbonizing any kind of fuel or carbonaceous substances. And the fifth part relates to the construction of a box or cylinder of any convenient form, by which the compounded carbon may be placed in layers or in other ways for the purposes of respiration.

APPLICATIONS FOR LETTERS PATENT.

191.—ROBERTS, S. H., Coleman Street, London, "Improvements in pipe-joints." Jan. 16, 1880.

205.—ATKINS, G., Birmingham, "Improvements in shade-holders for gas and other lamps." Jan. 16, 1880.

241.—HADDAN, H. J., Westminster, "Improvements in apparatus for discharging coal waggons or similar vehicles." A communication. Jan. 20, 1880.

275.—WATKINS, R., Walworth, London, "An improved water-waste preventer." Jan. 22, 1880.

282.—SUGG, W. T., Westminster, "Improvements in the construction of gas-burners." Jan. 22, 1880.

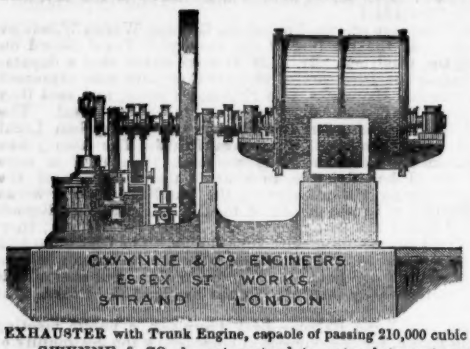
289.—LAKE, W. R., Southampton Buildings, London, "Improvements in apparatus for automatically lighting and extinguishing gas." A communication. Jan. 22, 1880.

PATENT WHICH HAS PASSED THE GREAT SEAL.

3140.—CLAYTON, S., Bradford, Yorks, "Improvements in motor-engines worked by gas or combustible vapour and air." Aug. 4, 1879.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

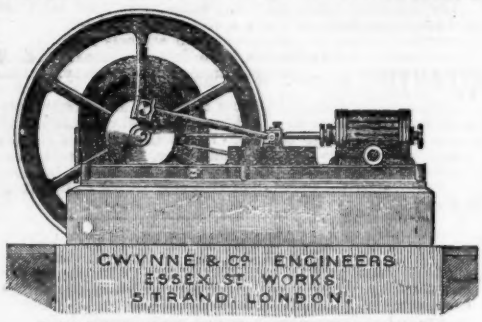
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

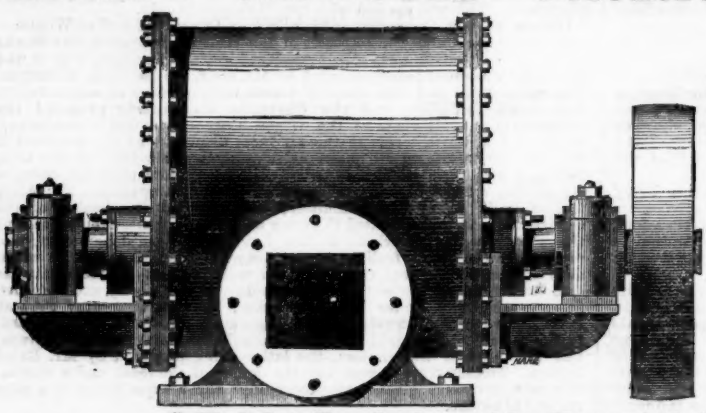
GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



WITH OR WITHOUT

WROUGHT-IRON SPINDLES AND

ENGINES COMBINED.

GEORGE WALLER & CO.,

MAKERS OF

ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHŒNIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

The Imperial Meter Company's Patent

WET METERS

Are known as the simplest Self-Regulating or Compensating Meters, allowing several inches variation in water-level, without any variation from minute accuracy of registration, and as less liable to derangement from any cause whatever, frost included, than any other Wet Meter hitherto tested by use on a large scale.

WET AND DRY GAS-METER WORKS,

KING'S ROAD, ST. PANCRAS, N.W.

FORMERLY ALSO (WALTER FORD) AT GRAY'S INN ROAD.

WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED (Second-Hand) Four Purifiers, Six feet square, with Centre-Valves, either Wet or Dry.
Apply to Mr. Dow, Town Clerk, DYSART.

WANTED, a Situation as Improver in Gas-Fitting, Bell-Hanging, and Lock-Smithing. Five years experience with good references.
Address JOHN N. MEREDITH, North Street, Rhayader, RADNOR.

WANTED, by a Young Man, a Situation as SMITH and GAS-FITTER, MAIN and SERVICE LAYER. Accustomed to Gas-Works in general.
Address No. 626, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, in a few weeks, a steady Man, to take the entire charge of a small Gas-Works. Must thoroughly understand the Making of Gas, Setting of Retorts, Main and Service Laying, Fixing Meters, &c. Wages 21s. per week, with good house, coal, gas, and garden.
Apply, with recent testimonials, to the Secretary, Campden Gas Company, Campden, near MORETON-IN-MARSH.

GAS-FITTER.

WANTED, a good Workman in Iron and Compo Pipe, who can Lay Mains and Services, is capable of doing Smithing, and also understands the routine of a Gas-Works. To a steady man the situation would be a permanent one.
Apply, with testimonials, stating wages required, to T. W. R. WHITE, Gas-Works, SHERBORNE.

WANTED, by an Energetic Man, aged 37, a Re-engagement as MANAGER of medium-sized Gas-Works, or as SECRETARY and MANAGER of a small Works, at home or abroad. 18 years practical experience. Is a first-class Carbonizer. Excellent testimonials.
Address No. 617, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a small Works in the Midland Counties, making about 4 millions per year, a STOKER to live on the premises, and take the Management of the Works under the Secretary. State age, reference, and wages. None but those who can produce first-class reference need apply.
Address No. 623, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AN Experienced Engineering Draughtsman desires Engagement in Designing Gas-Works Extensions and Gas Apparatus renewals. Good testimonials.
Address No. 624, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS COKE.

A LARGE QUANTITY required for delivery over a period of nine months.
Address, with price per ton into trucks at railway station, to G. J. EVESON, Gas, Coal, and Cannel Contractor, BIRMINGHAM.

PURIFIERS FOR SALE.—Four Second-hand, each 5 ft. by 5 ft. 4 in. by 2 ft. 9 in. deep.
Apply at the Gas-Works, Great Berkhampsted, HERTS.

FOR SALE.—Several Volumes of the JOURNAL OF GAS LIGHTING, from 1863 to 1877, inclusive; half bound, and in good condition.
Offers may be addressed to No. 620, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GASHOLDER—30 ft. by 14 ft.—for Sale; Contents 10,000 cubic feet. Also the Framing and Sheets of a similar Gasholder, taken down in large pieces Very suitable for roofing purposes.
Apply to the MANAGER of the St. Andrew's Gas Company, FIFE.

TENDERS FOR SULPHATE OF AMMONIA.

THE Directors of the Cork Gas Consumers Company are prepared to receive TENDERS for all the SULPHATE OF AMMONIA to be manufactured at their Works during the year 1880.
Delivery f.o.b. Cork.
Probable quantity, 100 tons. Payment, net cash on delivery. Prices to be fixed on basis of 24 per cent. Ammonia, and tenders to state whether packages are to be supplied free by sellers.
Tenders will be received up to Friday, Feb. 6, 1880.
By order,
DENNY LANE, Secretary.
Company's Offices, 72, South Mall, Cork, Jan. 17, 1880.

THE LONDON GASLIGHT COMPANY.
NOTICE is hereby given that an Extraordinary Special Meeting of the Proprietors of the London Gaslight Company will be held at the Offices of the Company, 26, Southampton Street, Strand, London, Middlesex, on Wednesday, Feb. 18, 1880, at Twelve o'clock at noon, for the purpose of considering and (if thought fit) approving of a Bill now pending in Parliament, intituled "A Bill to confer further powers upon the London Gaslight Company and for other purposes."
Dated this 19th day of January, 1880.
A. J. DOVE, Secretary.

THE SAN PAULO GAS COMPANY, LIMITED.

IN reply to the numerous inquiries of the Shareholders as to the effect the electric light is likely to produce upon the value of the shares, they are informed that the concession granted by the Imperial Government has clearly defined that if any improvement or scientific mode of lighting in place of gas shall be discovered, it shall be to the exclusive profit and advantage of the Company, should it be found necessary to adopt it.
By order of the Board.

CAST-IRON PIPES—A BARGAIN.

THE Billericay Union Rural Sanitary Authority have FOR SALE about 400 Yards run of new 10-in. Cast-Iron PIPES (coated); suitable for either Water or Gas Mains.
Apply to SAMUEL SHELLEY, Inspector, Brentwood, ESSEX.
Jan. 17, 1880.

CHEMICAL WORKS TO LET.

THE Burnside Chemical Works, Ayr, for the Distillation of Gas, Tar, and Water. Manufacture of Sulphate of Ammonia, Naphtha, Oil, Pitch, Lampblack, &c.
The Works are very conveniently situated for communication by rail and sea.
Apply to JAMES CAMPBELL, Writer, SALTCOATS.

TAR TANK WANTED.

THE Richmond (Surrey) Gas Company require a New or Second-Hand Cast-Iron TAR TANK for Storing Tar. Capacity about 70,000 or 80,000 Gallons.
Particulars may be obtained from
JAMES ELDRIDGE, Manager.
Gas-Works, Richmond, Surrey, Jan. 26, 1880.

GAS-WORKS EXTENSIONS.

ANY Gas Company having, by reason of Extensions, all or any of the following Apparatus to dispose of during the next three months, will oblige by forwarding particulars and prices to No. 625, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., before Jan. 31st. inst.:—

One Exhauster, 15,000 to 20,000 feet per hour.			
One Station Meter,	,,	,,	,,
One Scrubber,	,,	,,	,,

GARSTANG GAS COMPANY, LIMITED.

THE Directors of this Company are desirous of receiving Plans, Specifications, and Tenders for the Supply, Delivery, and Erection of the IRON WORKS required for about 1000 Lights. Further particulars may be obtained from the undersigned.
The Directors do not bind themselves to accept any plans or tenders.
JOHN NOBLE, Secretary.
Garstang, Jan. 23, 1880.

TO IRONFOUNDERS AND MANUFACTURERS.

THE Gas Committee of the Warrington Corporation are prepared to receive TENDERS for the Supply and Erection, on their new Works at Warrington, as follows, viz.:—
Contract No. 4.—Six PURIFIERS, 20 ft. square, with dry Centre-Valves and 18-in. Connections.
Contract No. 5.—About 62 Tons Cast-Iron COLUMNS and GIRDERS, and about 33 Tons Malleable-Iron GIRDERS.
Plans and specifications may be seen on application to the undersigned, in whose hands sealed tenders, endorsed (for respective contracts), must be lodged on or before Thursday, Feb. 12 next.
JAMES PATERSON, C.E., Engineer.
Gas-Works, Warrington, Jan. 17, 1880.

CORPORATION OF LEICESTER—GAS DEPARTMENT.

EXHIBITION OF GAS-ENGINES, COOKING-STOVES, BURNERS, AND OTHER APPARATUS.

THE Gas Committee of the Corporation of Leicester intend holding, from the 12th to the 17th of April next, an EXHIBITION of all kinds of Apparatus or Appliances showing the Advantages and Economical Uses of Gas for Engine, Cooking, Domestic, and other purposes. They will provide space, gas, and connections free, and give Certificates of Merit.
Intending Exhibitors will be furnished with printed conditions, forms for allotment of space, and any further information, on application to
G. A. AND C. S. ROBINSON, Managers.
Gas Offices, Millstone Lane, Jan. 23, 1880.

IN THE PRESS.

THIRD EDITION, "Improvements in Gas Apparatus." By GEORGE ANDERSON.
With 22 Illustrations of Retorts, Purifiers, &c., &c.
Re-written and enlarged, with a chapter on the "Purification of Gas," by Mr. S. H. PATTERSON, late Metropolitan Gas Referee.
To be had of WALTER KING, "JOURNAL OF GAS LIGHTING" Office, 11, Bolt Court, FLEET STREET, E.C.; or of the Author, 35A, Great George Street, WESTMINSTER.
N.B.—Orders received before Feb. 14—when the type will be scattered—4s.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to
FRANK M'GEDY, Secretary.
126, Chancery Lane, London.

BOROUGH OF LIVERPOOL—WATER ENGINEER'S DEPARTMENT.

PRINCIPAL DRAUGHTSMAN WANTED.

MUST have had considerable experience as Engineering and General Draughtsman, and possess a good Knowledge of Pumping Machinery and Gravitation Works.
Preference will be given to one who has held a responsible position under a Water-Works Engineer. Age not to exceed 40. Salary £250 per annum.
Applications, with the names and addresses of present and former employers, to be sent in not later than Thursday, Feb. 5 next, addressed to the Water Engineer, Municipal Offices, Liverpool, and endorsed, "Application for Principal Draughtsman."
By order,
JOSEPH RAYNER, Town Clerk.
Municipal Offices, Liverpool.

BOROUGH OF SOUTHAMPTON.

GAS-METER TESTING APPARATUS.

THE Corporation are prepared to receive TENDERS for the Supply and Fixing at the Corporation Offices the necessary Apparatus for Gas-Meter Testing under the Act of 1859 for Regulating Measures Used in Sales of Gas.
Each person tendering must submit designs, specifications, and particulars of the apparatus proposed to be supplied.
Further particulars can be obtained upon application to Mr. W. B. G. Bennett, Borough Surveyor.
Sealed tenders, properly endorsed, must be delivered to me on or before the 2nd of March next.
No pledge is given to accept the lowest or any tender.
By order,
R. S. PEARCE, Town Clerk.
Corporation Offices, 8, Gloucester Square,
Southampton, Jan. 23, 1880.

CORPORATION OF BIRMINGHAM—GAS DEPARTMENT.

THE Gas Committee of the Corporation of Birmingham are prepared to receive TENDERS for the TAR to be produced at their various Works for a period of One, Three, or Seven years, from the 30th of June next.
The quantities produced in 1879 were as follows:—

Saltley Works	8,500 Tons.
Windsor Street Works . . .	5,000 ,,
Adderley Street Works . . .	2,500 ,,
Swan Village Works	3,000 ,,
Total	19,000 Tons.

The Committee will receive tenders, either at a fixed price per ton, or at a price to be calculated on a sliding scale, varying with the selling price of products.
The Corporation are prepared to let on lease a portion of their surplus land, on which Tar Works could be erected.
Forms of tender may be obtained on application to me.
EDWIN SMITH, Secretary.
Old Square, Birmingham.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—
110 Mouthpieces, D-shape, 13 in. by 22 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes.
Also about 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in., 28 Mouthpieces, D-shape, 16 in. by 20 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in.
Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12 in. Slide-Valves and 12 in. Connections.
Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12 in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Exhauster (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 5 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Three 4-in. Pumps, with cranked Shafting and a pair Mitre Wheels.
Set of four Purifiers, 12 ft. by 12 ft. by 4 ft., with 12-in. Centre-Valve (Cockeys), and Connections and Lift complete.
Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12-in. Bye-Pass and Connections, to pass about 25,000 feet per hour.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
Two 12-in. Governors, by Wright, London, with 12-in Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned.
R. MORLAND, Engineer.

Now ready, Second Edition, price 7s., by post 7s. 3d., the

GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, M.I.C.E.

Orders to be sent to

WALTER KING,

11, BOLT COURT, FLEET STREET, LONDON, E.C.

WEST BROMWICH GAS-WORKS.

THE West Bromwich Improvement Commissioners are prepared to receive TENDERS from competent persons for certain Work at their new Gas-Works in connection with Contracts Nos. 6, 7, and 8.

Contract No. 6.—Making, Erecting, and Completing certain Ironwork in connection with the Retort Fittings.

Contract No. 7.—Making and Delivering Fire-clay Retorts, Bricks and Lumps, and Clay.

Contract No. 8.—Making and Delivering Cast-iron Main-Pipes and Appendages.

Duplicate copies of the drawings and specifications may be seen, and forms of tender with quantities may be obtained (on payment of One guinea in the case of each contract, which will be returned on receipt of a *bonâ fide* tender on the form supplied) on and after Thursday, Jan. 22, 1880, on application to the Engineer, Mr. G. W. Stevenson, 38, Parliament Street, Westminster, or to the undersigned, at the Town Hall, West Bromwich, and sealed tenders, properly endorsed, must be delivered on or before Saturday, the 31st inst., at my Offices in the Town Hall, West Bromwich.

The Gas Committee do not bind themselves to accept the lowest or any tender.

CHAS. H. BAYLEY, Clerk.

Town Hall, West Bromwich, Jan. 19, 1880.

GAS PLANT FOR SALE.

THE Gas Committee of the Corporation of Birmingham have for Sale, at their Fazeley Street Works, which are now closed, the following PLANT, viz.:—

Mouthpieces, 206 D-shaped 18 in. by 13 in., with wrought-iron Lids and Cross Bars.
Mouthpieces, 26 D-shape, 16 in. by 12 in., with wrought-iron Lids and Cross Bars.
Also 27 15-in. Circular, fitted with Morton's Self-Sealing Lids and Helman's Fastenings, together with 4 in. and 5-in. Ascension, H, and Dip Pipes, and D-shaped Hydraulic Main, &c.
Battery Condenser.
Annular ,,
Cast-Iron Measuring Tank, 18 ft. by 13 ft. by 4 ft.
Cast-Iron Scrubbers, four 18 ft. by 4 ft. diameter, and one 24 ft. by 6 ft. diameter.
Six 16 ft. Square Purifiers, with Lifting Crane, 14 in. Connections, Valves, &c.
Two 8-horse power Vertical Engines.
One Cornish Boiler, 4 ft. 6 in. diameter by 16 ft., by Fernihough and Sons, of Dukinfield.
One Egg-ended Boiler, 3 ft. 6 in. diameter by 12 ft.
One 20,000 cubic feet per hour Jones's Exhauster.
One 50,000 ,, ,,
One Hayward Tyler's "Special" Pump, with 4-in. Inlet and 5-in. Outlet.
One 40,000 cubic feet per hour Station-Meter.
One 20,000 ,, ,, ,,
One Cart-Weighing Machine.
12 in. and 14 in. Disc and Slide Valves, &c.
One 60-inch Letheby Photometer and Testing Apparatus.
Three Telescopic Gasholders, 62 ft. diameter by 34 ft. high.
Two 8-in. Governors.

For further particulars and to view, apply to Mr. CHARLES HUNT, Engineer, Gas-Works, Windsor Street, BIRMINGHAM.

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,
COTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.
Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

PORTSEA ISLAND GAS COMPANY.

THE Directors are desirous of receiving TENDERS for the following MOUTHPIECES, Tangye's patent, in good order and nearly new; taken down where West's system is now being adapted:—

Sixty 21 in. by 15 in. Oval on back to 18 in. Circular in front.
Ten 16 in. Circular.
Seventy 20 by 13 D's; all 15 in. deep from flange to face, with Sockets cast on for 6-in. Ascension-Pipes. Suitable for Beds of Sevens or Fives.

S. B. DARWIN, Secretary.

TENDERS FOR SULPHATE OF AMMONIA AND TAR.

THE Directors of the Devonport Gas and Coke Company are prepared to receive TENDERS for their make of SULPHATE of AMMONIA and their surplus TAR for a period of Twelve months, from the 1st of February, 1880.

Specifications may be had on application to the Secretary.

Tenders to be delivered on or before Monday, the 2nd day of February, 1880, addressed to the Chairman, Devonport Gas and Coke Company.

By order,
JOHN WILLING, Secretary.

THE Directors of the Ludlow Union Gas Company are prepared to receive TENDERS for the Supply and Erection of a TELESCOPIC GASHOLDER, 50 ft. in diameter and 18 ft. deep, in accordance with the drawings and specification deposited with the Manager, at the Gas-Works, Ludlow.

Tenders to be sent in to the Secretary, Ludlow Union Gas Company, Ludlow, not later than Feb. 14, 1880.

Full particulars and information can be obtained on application to the Manager, Gas-Works, Ludlow.

The Directors do not bind themselves to accept the lowest or any tender.

TO GAS ENGINEERS.

THE Directors of the Sheffield United Gaslight Company require the services of a Resident ENGINEER. The requisite qualifications are a thorough Practical Knowledge of Engineering, Preparation of Plans, and Construction of Works; the Manufacture and Distribution of Gas; and of Chemistry as applied to its Manufacture and Purification; also of the Making of Sulphate of Ammonia.

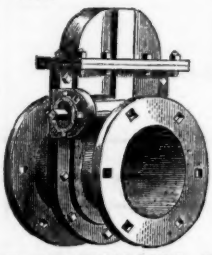
Applications, not later than the 14th prox., to be addressed to the Chairman of the Company, stating qualifications, age, salary required, references, &c

Testimonials in the first instance are not required.

Offices, Commercial Street, Sheffield, Jan. 10, 1880.

LONDONDERRY GAS COALS
DIRECT FROM THE
MARQUESS OF LONDONDERRY'S COLLIERIES.
COUNTY OF DURHAM.
For Prices and Particulars, apply to
MR. S. J. DITCHFIELD,
LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.
London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.

B. DONKIN & Co.'s
IMPROVED GAS-VALVES
WITH WROUGHT-IRON PINIONS.

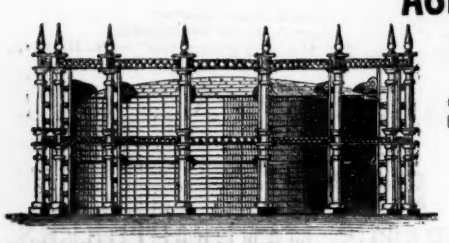


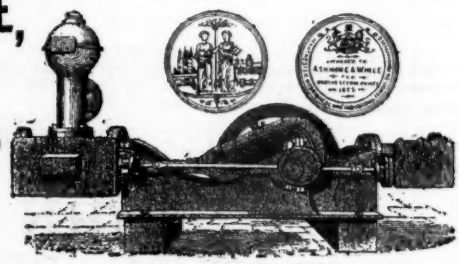
These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.
In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.
Also Sole Makers of
J. BEALE'S NEW PATENT GAS EXHAUSTERS,
and Makers of
STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS,
VALVES FOR AMMONIACAL LIQUOR,
IMPROVED BRIDGE VALVES FOR REGULATING THE SEAL IN HYDRAULIC MAINS,
BYE-PASS VALVES, SCREW WATER-VALVES, &c.
B. DONKIN & Co., BERMONDSEY, LONDON, S.E.

ECONOMY IN THE PRODUCTION OF GAS.
PLUTONIC CEMENT,
FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.
A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,
WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

GAS *v.* ELECTRIC LIGHT.
WIGHAM'S PATENT LIGHTHOUSE GAS-BURNERS,
For Street Lighting and the Illumination of Large Halls, Factories, Ship Yards, &c., where Powerful Light is required.
These Burners have been adopted by a School Board, having large school-rooms in charge, because of their high illuminating power and the facilities they give for perfect ventilation. The actinic power of these Burners is such that they are used successfully for Photography and Photo-Lithography.
SOLE MANUFACTURERS:
J. EDMUNDSON & CO., Gas Engineers, 19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

ASHMORE & WHILE,
HOPE IRON-WORKS,
STOCKTON-ON-TEES,
ENGINEERS
AND MAKERS OF





GASHOLDERS & APPARATUS, references to	. .	**100 Engineers.**
ROOFS	,, . .	**52 Erections.**
BRIDGES & GIRDERS . .	,, . .	**250 ,,**
BOILERS	,, . .	**43 ,,**
PURIFIERS & SCRUBBERS. .	,, . .	**115 ,,**

ALSO THE
"SLIDE-VALVE" STEAM-PUMP,
For Water, Tar, Grains, Soap, Thick Fluids, Chemical, Gas, or Iron Works, Mines, Breweries, Ships, &c. No possibility of Valves sticking, as they are actuated by a positive motion from an eccentric.
References to Forty-five Users.

M. DAVIS & CO., 27, Wellclose Square, LONDON, E.,

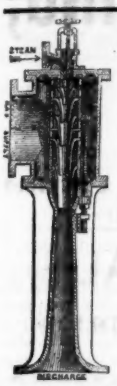
COMMERCIAL GLASS WORKS.

BEST OPAL SHEET GLASS, IN CASES OF 200 FEET.

150 Y	7d. per foot.	26 Y	11d. per foot.
21 Y	9d. ,,	32 Y	1s. 3d. ,,

Enamelled Sheet Glass, Flint and Opal, 1s. 2d. Coloured Glass and Opal, 1s. 6d. to 2s. 6d. per foot.

GAS GLASSES OF ALL DESCRIPTIONS ON HAND; SPECIAL PRICES FOR QUANTITIES.



KÖRTING'S STEAM-JET EXHAUSTER.

IMPROVED CLELAND'S PATENT.

UPWARDS OF 400 IN USE.

CLELAND'S SLOW-SPEED CONDENSER & STEAM SCRUBBER.

FOR PARTICULARS, APPLY TO

KÖRTING BROS.,

17, LANCASTER AVENUE, MANCHESTER.

TRADE MARK.

"LEATHER VICTORIA BELTING"

"VICTORIA,"

The Cheapest and Best

LEATHER BELTING IN LONDON.

The Leather is of the Best Possible Quality, and English Oak Tanned.

Sample Orders of over £5, Carriage Paid to nearest Railway Station.

Is Manufactured expressly for

J. C. R. OKES,

39, QUEEN VICTORIA STREET, LONDON, E.C.,

And can only be obtained from him or his Agents.

PRICES ON APPLICATION.

W. C. HOLMES & Co.,

ENGINEERS AND CONTRACTORS

FOR

GAS AND WATER-WORKS,

WHITESTONE IRON-WORKS,

HUDDERSFIELD.

REFERENCES TO UPWARDS OF 400 WORKS.

E. & W. H. HALEY,

IRONFOUNDERS & MAKERS OF

CAST-IRON PIPES

FOR

GAS, WATER, & STEAM.

LISTER HILLS FOUNDRY,

BRADFORD, YORKSHIRE.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in th Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

LAMBERT BROTHERS, WALSALL.

ALPHA TUBE & FITTING WORKS

Manufacturers of **W. J. WARNER'S PATENT MARKET GAS STAND-PIPE.**

Now ready, GAS CHANDELIER BOOK (Reduced Prices), 7s. 6d.

IMPROVED

COMPENSATING GAS-METER.

HUNT'S PATENT.

This Meter supplies a want long felt, by putting an end to the loss sustained by Gas Companies through the overworking of their Meters.

These Meters can now be supplied in either TIN-PLATE or CAST-IRON CASES, and OLD METERS converted to this plan. GAS COMPANIES and CORPORATIONS will find it to THEIR ADVANTAGE to adopt these Meters.

EXTRACTS FROM REPORTS.

"I am able to report that the Meters have given in each test most satisfactory results."—*Mr. H. Sporne, City of London Meter Inspector.*

"I consider the arrangement is a great improvement upon the Meters in present general use."—*Mr. T. Jackson, Meter Inspector, Birmingham.*

"I would observe from the results of my testings that the Meters are a great improvement on the ordinary Wet Meters in general use."—*Mr. H. Airey, Meter Inspector to the Metropolitan Board of Works.*

COPIES OF REPORTS SENT ON APPLICATION.

MANUFACTURED BY

JOHN BENT & SON,

WET AND DRY GAS-METER AND GAS APPARATUS MANUFACTURERS,

BELL BARN ROAD, BIRMINGHAM.

Established 1830.

WILLIAM SUGG'S
IMPROVED SYSTEM OF STREET LIGHTING,

SUITABLE FOR EITHER COMMON OR CANNEL GAS.

Results obtained in Illuminating Power from WILLIAM SUGG'S 200-candle Burners with Cannel and Common Gas:—

Variety of Gas.	Cubic Feet of Gas burnt per Hour.	Illuminating Power in Sperm Candles burning 120 Grains per Hour.	Number of Candles to which every Cubic Foot of Gas burnt is equivalent.
Common 16-candle	53·4	228	4·25
Cannel 19-candle.	47·3	252	4·76

Joint experiment by—

CHARLES HEISCH, Superintending Gas Examiner to the Corporation of London.

T. N. KIRKHAM, M.I.C.E., F.C.S.

C. MEYMOTT TIDY, M.A., M.B., Professor of Chemistry and of Forensic Medicine at the London Hospital, Medical Officer of Health for Islington, and late Deputy Medical Officer of Health for the City of London.

The Illuminating power of the gas made by this Company, on the 9th inst., was 22·7 standard sperm candles for a consumption of 5 cubic feet per hour, in a Sugg's No. 7 steatite bat's-wing burner. On the same day the following results were obtained from two of Sugg's large new Argand burners:—

FIRST EXPERIMENT.

Burner: Sugg's Argand, with two concentric flames.

Consumption per hour . . . . . 22·2 cubic feet.
Illuminating power . . . . . 103·7 candles.
or 4·67 candles per foot of gas.

SECOND EXPERIMENT.

Burner: Sugg's Argand, with three concentric flames.

Consumption per hour . . . . . 40·8 cubic feet.
Illuminating power. . . . . 208·8 candles.
or 5·12 candles per foot of gas.

I have reason to believe that these are as high, if not the highest results yet obtained per foot of gas from these burners.

(Signed) WILLIAM KING,
Liverpool United Gaslight Company,
Liverpool, April 16, 1879. Engineer's Office, Duke Street.

[See JOURNAL OF GAS LIGHTING, April 22, 1879.]

Sugg's 200-candle burner, with 42·09 cubic feet of 20·85-candle gas, gave an illuminating power of **231·56** candles.

Same quality of gas as used at Westminster Bridge, and Waterloo Place, Regent Street.

(Signed) A. C. M'MINN,
Engineer to The Gaslight and Coke Company,
June 16, 1879. Kensal Green Station.

SUGG'S ARGAND, WITH THREE CONCENTRIC RINGS.

Illuminating Power of Gas.	Standard of Comparison.	Gas Consumed per Hour.	Illuminating Power.	Illuminating Power per Cubic Foot.
		Cubic Feet.		
21 candles .	5-ft. London burner . .	45	220·5	4·9
		43	210·0	4·88

(Signed) J. R. FRITH,
Engineer, Runcorn Gas Company.

The following have been selected from a number of similar letters recently received:—

Reading, Nov. 12, 1879.

Your 200-candle Burner with Shadowless Lamp, erected here some months since, in the centre of four cross-roads, continues to give the greatest satisfaction, both to the public authorities and to this Company.

Before the Lamp was erected, several tests were made as to the real cost per hour (once in the presence of the Medical Officer of Health, Dr. Shea, who is the Gas Examiner for Reading), and from an average of these tests, we found that the best rate of consumption was at 52 feet per hour, and we had not the slightest reason to doubt that the Burner gave considerably over 200-candle power. I need scarcely refer to the beauty of the light, and while such street lighting can be effected at so small a cost, there is not much fear of electricity taking its place.

(Signed) EDWARD BAKER,
Engineer and Manager,
Reading Gas Company.

Dublin, Oct. 31, 1879.

In reply to your inquiry, I beg to say that your new reflecting Street-Lamps, which we have erected in Sackville Street, are giving the greatest satisfaction. They are greatly admired not alone for their beauty, but also in consequence of the Argand burner emitting a soft light, which is reflected with an entire absence of shadow. I have calculated that each of these lamps gives as much light as eight of the ordinary Street-Lamps.

(Signed) W. F. COTTON,
Secretary and Manager,
Dublin Alliance Gas Company.

Salford, Oct. 28, 1879.

In answer to your inquiry, I may state that we have three of your large Burners and Lanterns in use in Salford, each of which consumes 48 feet of gas per hour, and yields a light equal to 230 sperm candles. This is equal to 4·9 candles for every foot of gas consumed, *a larger amount of light than yielded by any other Burner.* An important point is that the Lanterns are so constructed that there is an entire absence of shadow.

(Signed) SAMUEL HUNTER, Assoc. I.C.E.
Engineer and Manager,
Salford Corporation Gas-Works.

Keighley, Oct. 31, 1879.

Our Committee being desirous of lighting certain positions in the town in a more effectual manner, requested me to fix one of your 200-candle Burners and improved Lanterns . . . . the object being to test the relative efficiency of different systems. The lamps were erected a few weeks since, when yours conveyed at once more favourable impressions. . . . Since that I have made a number of tests, and the favourable impressions yours made have been more than realized.

I may say that our Committee are so satisfied with your system that they have decided, when such lights are required, to adopt yours.

(Signed) JOHN LAYCOCK,
Engineer and Manager,
Keighley Gas-Works.

Blackburn, Nov. 27, 1879.

I have much pleasure in saying that for brilliancy and style I have never seen anything to equal your lamps. We have twelve 50-candle burners, two 80-candle, and one 200-candle in use, and after the Lamp Committee had inspected them, they were so highly pleased that they have resolved to erect similar lamps in all the public squares and crossings.

(Signed) S. R. OGDEN,
Engineer and Manager,
Blackburn Corporation Gas-Works.

PRICES AND PARTICULARS ON APPLICATION TO

WILLIAM SUGG,
GAS ENGINEER,
VINCENT WORKS, WESTMINSTER, S.W.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

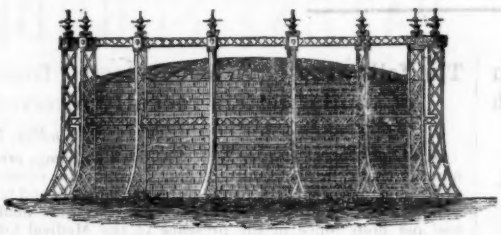
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, LONDON, E.C.,

HYDRAULIC ENGINEERS,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT STEAM-PUMPS,

More than 10,000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

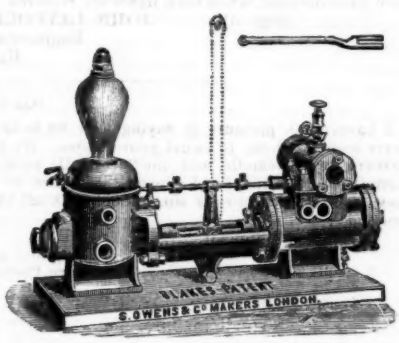
It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

It is compact and durable.



It is interchangeable in all its working parts.

It will deliver more water than any other pump.

It is made of best materials in the most workmanlike manner.

Can be worked at 20 strokes per hour, or 200 strokes per minute.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

SOLE MANUFACTURERS OF

MANN & OWENS

IMPROVED PATENT GAS-VALVES.

PRICED LISTS AND FULL PARTICULARS FURNISHED ON APPLICATION.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash and when Cannel of the best description is scarce, it may well replace this material."

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

SANDELL AND SON,

PUBLIC ACCOUNTANTS,

2, GREAT GEORGE STREET, WESTMINSTER.

SANDELL AND SON having been engaged during the past 25 years in Gas Companies Accounts, either in Preparing or Investigating Statements for Parliamentary Applications, Arbitrations, and otherwise, offer with confidence their Services for similar purposes.

Mr. ROBERT DEMPSTER,

CONSULTING GAS ENGINEER,

ELLAND, near HALIFAX,

May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations is both extensive and reliable.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

HARPER & MOORES,

PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

STOURBRIDGE.

Manufacturers of all Descriptions of

BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

ESTABLISHED 1836.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. SILVER MEDAL, PARIS, 1878.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

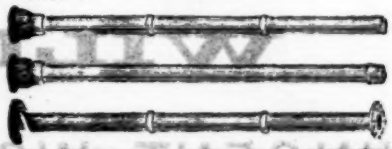
NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

30, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B., GLASGOW.

Prices on application

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im- portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, re- quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

THE

SILBER LIGHT COMPANY,

MANUFACTURERS OF

SILBER'S PATENT TUBULATED BURNERS

FOR

COAL OR AIR GAS,

And of SILBER'S BAT'S-WING GAS-BURNERS and every variety of Gas-Fittings.

ALSO MANUFACTURERS OF

EVERY DESCRIPTION OF LAMPS (burning Colza Oil, Petroleum, Paraffin, or Kerosene) FOR DOMESTIC PURPOSES, STREETS, RAILWAY STATIONS, SHIPS, &c., &c.

FIG. 1.
Silber's Patent Tubulated Gas-Burner, drawn full size.

FIG. 2.
Section of Silber's Tubulated Gas-Burner, the arrows indicating the currents of air to the flame—two externally and two internally.
Dr. Wallace, F.R.S.E., Gas Analyst of Glasgow, says of this burner: "It gives the steadiest flame of any Argand yet constructed."

FIG. 3.
Silber's Tubulated Gas-Burner with glass bulb or vase beneath, and with larger inlet than aggregate outlet area, by which means the illuminating power for 5 cubic feet of 16-candle-light gas is increased one candle.

The Silber Tubulated Gas-Burner offers the following advantages over existing Argand Gas-Burners:—

1. It affords more light for 5 cubic feet of gas.
2. It is made of brass, and so put together that there is no liability of its melting, or coming to pieces in any other way, as burners made of soft metal are apt to do.
3. It is capable of burning from 4 to 7 cubic feet of gas per hour (by using chimneys of different lengths), and although the consumption be increased, **the illuminating power per cubic foot of gas remains almost quite constant.**
4. With the glass bulb or vase, as shown in fig. 3, the illuminating power for 5 cubic feet of 16-candle-light gas is **increased one candle.**

FIG. 4.
Silber's Bat's-Wing Gas-Burner.
The results obtained from this Burner are amongst the best obtained from any flat-flame Burners yet introduced.

FULL PARTICULARS & ENGRAVINGS

Forwarded on application to

THE SILBER LIGHT COMPANY,

49, WHITECROSS STREET,

LONDON, E.C.

FIG. 5.
Silber's Bat's-Wing Burner, with Opal Gas Moon.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,530 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND Co., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

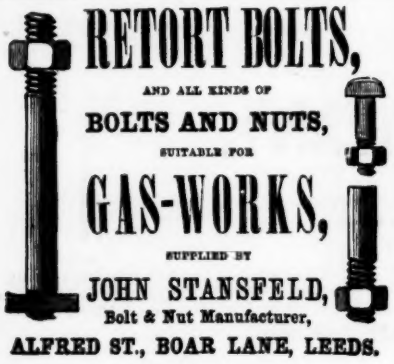
Agent in London, Mr. JAMES MANWARING, 101 Cannon Street, E.C.

M. BREMOND'S NAPHTHALINE PROCESS.

All negotiations respecting M. Brémond's patented process for preventing Deposits of

NAPHTHALINE

in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BREMOND, Gas Engineer, Compania Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

FERRAND DAVIES,

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AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

THE

THAMES BANK IRON COMPANY,

OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS AND ALL KINDS OF GAS-WORKS APPARATUS,

SOCKET-PIPES FOR GAS OR WATER PURPOSES,

FLANGE-PIPES FOR STEAM,

RAIN-WATER PIPES AND GUTTERS,

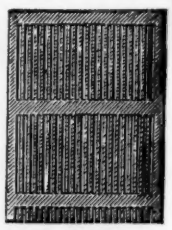
HOT-WATER BOILERS, PIPES, AND CONNECTIONS,

LAMP-COLUMNS, LAMPS, LAMP-FRAMES, WROUGHT TUBES, &c.,

HOT WATER AND HOT AIR APPARATUS,

Erected complete on the most Improved Principles.

R. DEMPSTER AND SON'S



WOOD SIEVES FOR PURIFIERS,

WITH TAPER OR PARALLEL BARS,

MADE BY SPECIAL MACHINERY.

SCRUBBERS FILLED WITH BOARDS,

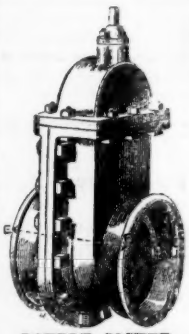
On our approved principle, for the extraction of Ammonia.

Prices on application. References to First-Class Engineers.

ROSE MOUNT IRON-WORKS,

ELLAND, NEAR HALIFAX.

LONDON OFFICES: 2, SUFFOLK LANE, CANNON STREET, E.C.



DOUBLE SOCKET.

IMPROVED SCREW-VALVES,

For Water, Tar, Ammoniacal Liquor, &c.

MADE EITHER WITH FLANGED OR SOCKET ENDS.

B. DONKIN & Co.

BERMONDSEY, LONDON, S.E.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

THE WIGAN COAL & IRON COMPANY,

LIMITED,

DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!

G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

PARIS EXHIBITION, 1878.

THREE MEDALS

AND

HONOURABLE MENTION

HAVE BEEN AWARDED TO

JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

SILVER MEDAL

FOR THEIR

PATENT MACHINE-MADE RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4. inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

THE PORTER-CLARK PROCESS

FOR THE

SOFTENING AND FILTRATION OF WATER IN LARGE QUANTITIES, WITHIN SMALL SPACE, AT SMALL COST.

(*See* JOURNAL *of Jan.* 6, 1880.)

In an article upon the Swindon Water Supply, the *Wilts and Gloucestershire Standard* of Aug. 9, 1879, says:—

"All praise is due to the Company who have thus provided a water supply that, if it can be equalled, we are safe in saying cannot be surpassed. . . . For the information of all caterers for public health, we explain that the mode of so effectually Purifying and softening the really good and naturally wholesome water is the 'PORTER-CLARK PROCESS.' 'CLARK'S PROCESS' was known to be chemically admirable; the improvements, however, effected by Mr. Porter, mechanically, are curious as they are perfect."

The filtration is exquisite, and everything arrested is removed daily.

The Visiting Justices of the Kent County Asylum at Chartham on Aug. 29, 1879—

Resolved, "That a favourable testimonial be given to Mr. Porter for his system down to the present time, and that the Clerk forward a copy of this resolution to Mr. Porter." (50,000 gallons daily.)

The Visiting Justices of the Middlesex County Asylum, Banstead Downs, under date of Sept. 12, 1879—

Certify, "That up to the present time the 'PORTER-CLARK WATER-SOFTENING PROCESS,' which has been in operation at this Asylum for about two years, has satisfactorily answered the purposes for which it was intended." (60,000 gallons daily.)

(See *The Times*, Aug. 23, 1877, Paper by Mr. F. J. Bramwell, F.R.S., Meeting of British Association, Plymouth.)

The Proprietor of the *Daily Chronicle* and *Lloyd's Weekly News* writes, Sept. 17, 1879—

"The 'PORTER-CLARK WATER-SOFTENING PROCESS,' erected by you at my paper-mill at Sittingbourne, continues to give satisfaction, and I no longer have any trouble with my steam-boilers. I am not yet working the filters up to their full capacity, only softening about 80,000 gallons per 24 hours, whereas I could easily do more than 120,000 gallons. I may add that it only requires one man to attend to the whole operation."

PATENTED BY JOHN HENDERSON PORTER, C.E.,

1 & 2, TUDOR STREET, BLACKFRIARS, LONDON, E.C.

NEW PATENT WET GAS-METER,

THE "RELIANCE,"

MANUFACTURED BY THE

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,
238, KINGSLAND ROAD, LONDON.

CIRCULAR TO GAS COMPANIES AND OTHERS.

Stourbridge, Jan., 1880.

DEAR SIRS,—As the time for ordering stock for your general requirements for this year is approaching, we beg to call your attention to the various articles of our manufacture, and to solicit your early commands.

Fire-Clay Gas-Retorts.—As some of our friends appear to prefer these *machine made*, we have arranged to supply machine-made Retorts at same price as hand-made ones. At the same time, although it is to our advantage to supply machine-made, we do not recommend them, for the reason stated to you in our Circular of November, 1878. We have a very large stock of Retorts, all in good condition, and of such an assortment that we could supply any size on receipt of order.

Fire-Bricks and Fire-Clay Settings of all Shapes and Sizes.—We have a large and varied stock, or could make to special design at short notice.

Staffordshire Blue Bricks and Paving Bricks.—We shall be glad to submit prices and samples of these on hearing from you, with specification, and we venture to say our brand in these goods is unsurpassed. Hard Blue Paving Quarries make the best kind of Pavement for Retort-Houses, &c.

Coloured and White Glazed Bricks, Porcelain Baths, Kitchen Sinks, Corner Sinks, &c., we are making a great speciality of, and have no hesitation in saying that our glazed goods are unequalled for soundness of manufacture and purity of colour.

Earthenware Drain-Pipes, Cast-Iron Pipes, Wrought-Iron Tubing.—We should be glad of an opportunity of quoting you for these when you are in the market.

Lime, Cement, Plaster of Paris.—Our Lime Kilns at Brettell Lane are now in full operation, and we are in a position to supply any quantity of pure Lime manufactured only from the Earl of Dudley's best Limestone Beds. Our Cements and Plaster of Paris will withstand any required test.

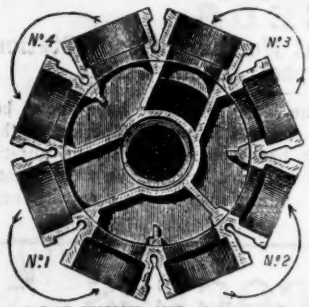
References and Testimonials.—We can furnish you with any number of these; and may mention that during the last thirty-five years we supplied most of the Gas-Works in the United Kingdom and Abroad, and that we have held contracts from Her Majesty's Government for more than Twenty years consecutively.

Awaiting your esteemed favours,

We remain, Dear Sirs, your obedient servants,

HARRIS & PEARSON.

Note.—We shall be pleased to furnish Drawings and Specifications, if desired, and shall be most happy to see you or any of your Engineers here at any time; or, if you would like to see any of our representatives or ourselves at your Works, shall be glad to wait upon you by appointment.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Plan.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW,

SOLE MAKERS OF

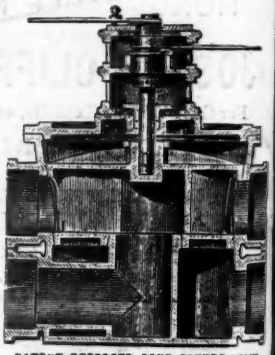
PATENT

RECESSED CONE CENTRE-VALVES,

Constructed on the principle of the ordinary Plug-Cock.

THROUGH-WAY & FOUR-WAY COCKS

Of all descriptions.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Elevation.

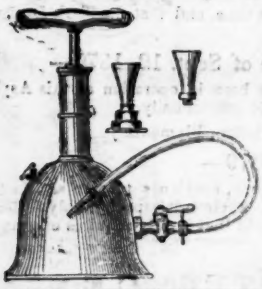
London Office: 6, LITTLE BUSH LANE, CANNON STREET.

D. HULETT & CO.

Invite the attention of Gas Companies, Corporations, and others to their

PATENT STREET LAMPS,

Which are so constructed that neither putty nor other materials are required to secure the glass. No hacking out of old putty, which frequently destroys the frames. A new pane of glass can be inserted in two or three minutes by any inexperienced person, the glass being secured by a hinged flap and turn button.



PRICE, with Opaline Reflecting Top, 12s.; with Fluted Glass Top, 10s. 6d.
Also made EXTRA STOUT recommended for its durability.

D. HULETT'S IMPROVED SERVICE CLEANSER,

By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

HULETT'S PATENT MERCURIAL REGULATOR,

For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

PATENTEES OF IMPROVED WET AND DRY GAS-METERS.

Makers of all kinds of Pressure-Gauges, Gaseliers, and every kind of Gas-Fittings for the Trade.

GAS HEATING AND COOKING STOVES.

55 and 56, HIGH HOLBORN, LONDON.

London: Printed by WALTER KING, for the Executors of the late WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street in the City of London.—Tuesday, January 27, 1880.